

# AVIATION WEEK

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JULY 16, 1956

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Air Traffic Snarl

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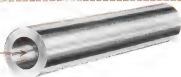
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■ One of eight permanent Ordnance Corps facilities, Redstone is the center for the Army's rocket and guided missile program. Its 40,000 acres are located on the Tennessee River near Huntsville, Ala., and house research laboratories, environmental test equipment and several rocket-testing ranges. Redstone Arsenal's military and civilian scientists and engineers produce weapons ranging from a tiny training rocket to the giant IRBM, now being developed on a crash basis by the recently-established Army Ballistic Missile Agency.

From the research, development, production and field service headquarters located at Redstone flow thousands of directives covering the rocket and guided missile work being done by research laboratories, universities and private industry throughout the nation. Weapons systems developed by the Ordnance-Industry team include the Super Bucek's infantry rocket, the Honest John artillery rocket, the Corporal missile and the Nike anti-aircraft missile.

Scoreless banners of AB tests are being broken by the 9,000 employees of Redstone Arsenal, but the exciting and difficult technology of guided missile development constantly presents new problems. Electronic computers check every detail of missile trajectory hour after hour, while at night rockets equipped with heat-seeking streak down-range, adding valuable data to our country's new arsenal of defense.

**ARMY'S BALLISTIC MISSILE** — The long-range guided missile, ballistic missile weapon not developed by the Arsenal's guided missile team headed by Dr. Wernher von Braun. The Institute is the producer of the Army's IRBM, the Jupiter.



FORD INSTRUMENT, through its own laboratory, accuracy of power supply and other essential test conditions in a project for the Guided Missile Development Division of the Redstone Arsenal.

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## We Are All to Blame

The bureaucratic chicanery by government officials trying to fix official blame for the Grand Canyon midair collision that cost 128 lives is an unnecessary farce. It doesn't take an investigation by the Civil Aeronautics Board or a committee of Congress to determine what killed the crews and passengers aboard United Air Lines' DC-7 and Trans World Airlines' Super Constellation.

The pilots and their passengers were victims of an antiquated air-traffic-control system and the crumbled industry and governmental apathy that has blocked any real progress towards establishing a modern federal air-ways system.

Blame for the Grand Canyon collision should be shared by almost every segment of the coal aviation industry, whatever the verdict of the CAB may be.

For example, what about Mr. Ronald Hughes and the Bureau of the Budget which he headed until April 1969? For the past three years the Budget Bureau has singled out every Civil Aeronautics Administration request for new electronic airways equipment. Only a few weeks ago, operating under the cloak of the Administration's security restrictions, the Budget Bureau forced a \$17 million out and prevented the CAA from requesting the full \$55 million it needs to get over the first year's payment of its five-year airways improvement program started.

What about the Honorable Senator Weeks and his henchman Robert Munn and Louis Rothchild, who, as Undersecretaries of Commerce for Transportation, have devoted themselves to squandering money from CAA airport projects?

What about a succession of CAA administrators who have failed to tell the public and the Congress the truth about the growing crisis in air traffic control? What about their failure to organize any effective programs to build a modern airway system until late last summer?

What about the Congressmen themselves who have consistently voted to slash CAA users' budgets and who only this year voted the budget cut that derailed the Air Navigation and Development Board?

What about top airline managers who will remain in traffic control for fear it would frighten customers away? Would it have frightened customers as much as the 128 wasted corpses on the bottom of the Grand Canyon? Or will it frighten them more than the similar tragedies that are bound to occur in high-density metropolitan areas before any measures are implemented as we discussed?

What about the airline pilots themselves? They have been one of the loudest voices raised in protest over the antiquated union system and the light-housekeeper's philosophy that dominated it. But did they shout effectively enough or back their protests by the kind of action that will have results?

Not even the military escape their share of blame. Both the Air Force and the Navy have blocked progress immeasurably by clanking their applicable developments in unnecessary military services and by their reluctance to work wholeheartedly towards establishment of a truly common civil aviation services system.

Amnesty Week has used its voice for over a year in warnings of the impending crisis and pleas for effective action to avert it. Last August 8 we cited the appalling

statistics of the Air Transport Association "near miss" survey and the mid-air collisions already occurring during high-altitude operations of the Strategic Air Command. We write:

"A much more vigorous approach to the grave problem of air traffic control is necessary now if solution is to avoid the tragic consequences of more mid-air collisions, economic strangulation of airline revenues and blunted efficiency of Strategic Air Command and Air Defense Command operations."

Again on October 10 we warmed:

<sup>a</sup>Above and beyond all this endless debate and terminology, progress waits for the twin species of a new-like air defense and mid-air collisions involving 40 to 60 passenger transports over heavily populated metropolitan areas that lie underneath the most congested air traffic corridors.

"Ten year ultimate goal studies are necessary to keep pace with the rapid expansion of air traffic BUT THE AIRSPACE CONTROL PROBLEM IS WITH US NOW IN A MOST DANGEROUS FORM. It requires immediate action along with future planning if we are to avoid the twin disasters cited above."

Yes, we shouted but, like the airline pilots, we are to blame too because we didn't shout loud enough or long enough to shatter official myths.

Not until early this year when the blunt, accurate language of the Harding report scared Meers, Weeks, Rothschild and Hughes on the traffic control system did the Eisenhower Administration begin to take this problem seriously.

The new CAA administrator Charles Lewan and his deputy administrator James Pyle are experienced pilots well versed in the dangerous shortcomings of the airspace and air-traffic-control systems.

They have more sound ideas on how to tackle the problem for immediate action and long-range solution. But they will fall into the same sort of bureaucratic red tape unless they are supported from the top down by the Eisenhower Administration and are at least allowed to ask for the funds they know they need to keep more people from being slaughtered in traffic-control accidents. They also will need support from Congress, the airline industry, the airline pilots, the military and the public if anything except more committee wangling and inaction can be expected.

The current CAA plan call for spending \$286 million for new electronic equipment over a five-year period. Virtually every type of equipment in the program is already available. Why can't the money be made available now so CAA can crank more safety into the highways as fast as three years instead of five?

Why can't the Tianjin DMIC mess be settled so that the jet airframe of 1999 can enter into a stable, modernized traffic-control system instead of adding to the hazard?

HOW MANY MORE PEOPLE WILL HAVE TO BE KILLED IN MID-AIR COLLISIONS BEFORE THE GOVERNMENT AND THE AIRLINE INDUSTRY WILL TAKE EFFECTIVE ACTION TO MODERNIZE THE AIRWAYS AND AIR TRAFFIC CONTROL SYSTEM?

—Robert Hertz

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Most of the tail section and many other vital parts of North American's F-100C supersonic fighter are made of titanium. It not only reduces gross weight by several hundred pounds, it withstands the soaring combination of engine and aerodynamic heat.

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## WHO'S WHERE

### In the Front Office

**Lt. Gen. Edward R. Gensler (USAF, ret.)** board chairman and chief executive officer, **Yogo Industries, Inc.**, Los Angeles, Calif.  
**E. D. Wilger** (ret. president) general manager, **Aerotec Development, Inc.**, Burbank, Calif.

**R. W. Wilson**, executive vice president and director, **Clarendon Pacific Aircraft, Inc.**, New York, N.Y.  
**R. E. Phillips**, vice president operations, and **H. B. Bennett**, vice president sales and chief

**Ray Adams**, **Wellington T. Hines, USAF**, Air Force general representative, **Devcon Chemical Corp.**, New York, N.Y.  
**Frank J. Ehrlich**, regional vice president (Miami, Fla.), **Air Turbine International Corp.**, New York, N.Y.

**Carl P. Scheraga**, technical director, **NASA Laboratory**, Dayton, **Nathan Kohn**, Corp., New York, N.Y.  
**Walter P. Pappas**, board chairman of **Continental Corporation of America**, a direct

**Contractor Air Lines, Inc.**  
**H. D. Miller**, vice president also **Phibco Manufacturing Corp.**, Costa Mesa, Calif.  
**William G. Strickland**, vice president general sales manager, **IMP Engineering Corp.**, Hollywood, Calif.

**Robert V. Werner**, vice president-supervisory, **Calder Corp.**, San Diego, Calif.  
**Ray Gen. M. G. Woodburn, USAF (ret.)** vice president, **Airtronics and Electronics Research Division**, **International Electronics Engineering, Inc.**, Washington, D. C.

### Houses and Elections

**R. M. Woodburn**, company director of **Armstrong Whitworth Aircraft, Ltd.**, reported the **Red Silver Transonic Award** from the **Society of General Aircraft Engineers**, presented to **Lockheed** upon the wings of their success and their overall service and contribution to the aircraft industry.

**James H. Smith**, Assistant Secretary of the **Navy** for Air, received the **Distinguished Public Service Award** for his outstanding leadership and contributions in naval aviation during his term of office (1955-1960). **Gregory Glaser**, president and director general, **Suaco, Inc.**, French president of the **Society of French Aircraft Constructors**.

### Changes

**Joseph R. Fennell**, managing director, **Calder Sales Company** of **England Ltd.**, **Middleton**.

**M. C. Hammond-Ailes**, European district manager, **Comco Switzerland Ltd.**, **London, England**, **London, N.Y.** **Alfred D. Hillman**, vice president manager, **Langley R. Hillman**, senior engineer, **Mechanical Engineering Dept.**, **United States Training Co.**, **Hoboken, N.J.**

**Capt. James N. Wen**, chief of flight operations, **British Commonwealth Aircraft Corp.**  
**John C. Jack, Jr.**, machine manager, air control dept., **Southwest American Co.**, **Los Angeles, Calif.**  
**Forbes Mann**, program control manager, **Chance Vought Aircraft, Inc.**, **Dallas, Tex.**

## INDUSTRY OBSERVER

**Boeing X-2** is about ready for more high speed runs at **Edwards AFB** after modification of its **Curtis-Wright** rocket engine needed to produce more thrust. Two new pilots are being checked out to fly the X-2 in place of **Lt. Col. Pete Everest**, who has made earlier high speed runs.

**Chrysler's XE-58** supersonic bomber has been completed at **Fort Worth** and rolled into the experimental hangar for final touches before test runs. The test runs are scheduled to begin in early August. **XE-58** is powered by four polished **General Electric J79** turbojets and features a delta wing design.

**Military needs** for **VHF** frequencies for long-range radar may be the primary reason behind the recent proposal by the **Federal Communications Commission** to move present **VHF** television stations onto the **UHF** band within the next 10 years. Anonymous sources for the proposal were said to be the preference of **UHF** stations now attempting to compete with **VHF** operators.

**Watch** for the **Soviet Union** to increase the scope of its aircraft export program to include jet fighters and transports for both **accredited** and **unaccredited** U. S. S. R. already has supplied its aircraft with both **British** engines and jet combat aircraft. This type conflict makes a profitable dumping ground for obsolete Soviet equipment and enables the **Russian** air force to phase in new model types at a rate as technically possible. The **Soviet government** now has large stocks of **Mig-17** fighters for better use, that the **Mig-19** **Fury** has become the standard first line fighter type in the **Red Air Force**.

**Wright Air Development Center** has launched a major program for development of new engine components capable of operating at temperatures of 500 degrees centigrade in the presence of nuclear radiation. Program should result in radically new component materials and techniques. Mayhew of the task can be seen from the fact that the components' industry required 10 years to meet top operating temperatures from 55 degrees centigrade to the present 125-150 degree heat.

**Dr. Wiley E. Messersmith**, designer of **World War II** **General's** **Mig-19** and the jet-propelled **Mig-21**, has designed a supersonic delta-wing fighter fighter for the **Harpoon/Aviation S. A.** The **Spanish aircraft** will be known as the **EA-500**.

**First underground military electronics factory** in the **U. S.** may be built in the **Army Signal Corps**. The agency is at present negotiating with several major firms, including **General Electric** and the **Radio Corp. of America**.

**A multi-billion dollar program** to integrate and expand **USAF's** communications into an efficient, speech "world-wide Bell system" will be launched by **Remco Air Development Center**. The program's scope and cost may amount that of the **SAGE** air defense system.

**Howard Hughes** put pressure on **Convair** to change the nose of its new jet transport from **Skunk** to the present **Golden Arrow** and to use gold-kilns metal for the aircraft's exterior. **Convair** now uses the designation **Model 580** for the transport.

**Turboprop** version of the **Spanish** transport, the **CASA 397** **Aero**, will be built in **Germany** by **Humboldt Flugzeugbau (Hofmann and Vogt)** under a license contract with **Constructores Aeronauticos de Madrid**. The transport, to be powered by two **Napier Eole** turboprop engines, will have a cruising speed of approximately 300 mph.

**Armstrong General Corp.** has received a **\$193,936** **Air Research and Development Command** contract for research on ultrasonic techniques for rocket problems.

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## WASHINGTON ROUNDUP

### Congress Enters Talos Scrop

Under remaining Congressional pressure, the appointment of a non-scientist, sensible board to evaluate the relative merits of the Avon's Nike missile and the Air Force's Talos missile, both against the Soviet missile, is now inevitable. These new developments look well.

• **Confidence of both houses** agreed to an allocation of \$16 million for Talos launching facilities in the 91-100th military budget. Both allocations will be put into law. It was noted that the money may not be appropriated without the approval of the House and Senate Armed Services Committees. The Senate committee previously had allocated the \$16 million "and the relative merits of both (Nike and Talos) systems have been positively noted and the risks and reasons (of USMC and Army) cleared" (AW July 2, p. 31).

• **House Appropriations Committee** approved appropriations for Talos sites "to avoid any undue delay in the defense build up" but directed the Director of Defense to "take immediate steps to appoint a committee of qualified experts, selected from outside of the military departments or private business categories, which will be directly involved, to make an impartial and objective evaluation as to the merits and potentialities of the Talos and Nike missiles in defense against."

### Defense Information Channels

Department of Defense plans to set up a special panel for dissemination of information, reports on World War II and subsequent military operations and to appoint a special assistant to expedite the dissemination of scientific information "to the defense without. These facts were reported last week by Robert Tappan Ray, Assistant Secretary of Defense for Legislative and Public Affairs, in testimony before the House Special Subcommittee on Information.

Ray said there are over 100,000 classified files on World War II alone, and that, with present personnel a declassification review has "roughly been unacceptably impossible."

Committee members, however, were skeptical over two points made by Ray—that the Office of Information of the Secretary of Defense is the "sole agency" for the dissemination of defense information and that it is inevitable to be released should be "constructive."

Under questioning by Rep. Dante Fascell (D-Fla.), Ray concluded that if the military services do not choose to submit information, the Office of Information has no procedure for knowing what it makes a specific request in made from an outside source.

"The channel for information whose never gets any higher than the agencies—we don't see it if they don't want it released," Fascell commented.

### Legislation Outlook

Congress is taking quick action on numerous aviation matters in adjustment with the military services.

• **Reauthorization** The House Ways and Means Committee has approved extensions of the act authorizing profits from government business in the independent oil Refining and Distribution Board from Dec. 31, 1956, to Dec. 31, 1957. Final enactment appears certain. The committee recommended that firm with government busi-

ness amounting to \$500,000 or less annually be exempted. The present maximum is \$250,000.

• **Annual postage** The House has voted, 217 to 155, to increase the annual postage rate from six to seven cents an ounce, but there is little likelihood the Senate will act on the measure.

• **Accident Settlement** Congress has completed action on legislation authorizing the death penalty for willful sale of commercial, charter or foreign aircraft.

• **Independent CAA** Sen. Mike Mansfield (D-Mt.), chairman of the Aviation Subcommittee, is optimistic that the full Senate Commerce Committee will approve legislation establishing the Civil Aeronautics Administration as an independent agency. The vote in committee, however, is expected to be close, and the legislation is not expected to go much further during the week ending July 6 of the session.

• **Alaska Airlines** Both the House and Senate have approved legislation directing the Civil Aeronautics Board to grant permanent certificates to new Alaska and Alaska Airlines. The House, however, has failed at legislation directing permanent certificates to U.S. Alaska service. "Northern Airlines" Alaska-Alaska agreement and the Seattle-Alaska agreement of Pacific Northern Airlines and Alaska Airlines. The Senate passed this measure, but, in view of the House position, it has little chance of enactment.

• **International Negotiations** The Senate Commerce Committee has approved legislation requiring advisory participation in the negotiation of bilateral international aviation agreements eliminating the authority of the President in U.S. international aviation cases and limiting it to international trade cases to increase efficiency in the defense and foreign policy. The proposal is for a presidential veto even if the measure should be cleared in the Congress.

• **Minister travel** The Senate has passed legislation authorizing all air carriers to offer free or reduced transportation to ministers on space available on U.S. flag carriers. The House has not yet acted on the measure.

• **Airline equipment** The Senate, by a vote of 51 to 22, authorized legislation permitting subleased aircraft to be set aside for use by the military. The measure is intended to provide for the purchase of new equipment without being considered as profits, which would reduce military allowances. Sen. John W. Fulbright (D-Ark.) had a strong but unsuccessful fight against the measure (AW June 26, p. 25). With the support of principally influential local-state airlines, the measure appears to have a good chance of House passage.

### Steel Strike and Defense

Defense Department is not immediately concerned about the possibility of the steel strike interfering with missile industry operations. The Commerce Department has ordered manufacturers to reserve certain items, the defense industries. So far, the Air Materiel Command has no reason to believe in the possibility of its construction, but the USAF is confident that the country will survive even despite the walkout. Defense is most worried about the supply of construction-type steel. These items are produced in the mills now out of operation and have relatively short lead times.

—Washington Staff



as needed for extracting fuel types since oxygen can be quenched far more than can type.

The CAA will require that all jet transports demonstrate rapid descent capabilities in the event of sudden cabin depressurization. Type certification will be withheld unless hydroblasted aircraft are equipped to meet this requirement resulting from explosive decompression.

Because of higher flight levels required by jet transports, high-altitude VGRs are now under consideration. The CAA plan calls for VGR transmittance diffusion of 200 nautical miles at altitudes between 30,000 and 75,000 ft. Approximately 70% of VGRs in the U.S. now provide coverage up to 60,000 ft; their range in this altitude is approximately 115 miles.

To ease congestion in the communications band, the CAA has taken an initial step from the present 200 kc to 700 kc channel spacing. As soon as present 200 kc channels will be followed by 700 kc channeling of the band.

The report and traffic at high altitude will operate in controlled airspace. A high-altitude radar structure is being worked out in cooperation with the military and airline industry, and the report anticipates further advances in this field when control of all airspace above 25,000 feet is undertaken during 1957.

Damage to maneuver and two-strip air force from jet heat loads is not unusual and a problem because of the outward, rather than downward direction of the thrust. Also, since no engine run up is required to get going into maneuvers, burst deceleration is rapid.

Jet fuel spilled on Portland cement concrete pavements, however, has a dis-

solving action. On asphaltic concrete pavements, the fuel produces a softening effect which may result in rutting under wheel loads.

Paints now used for runway markings do not stand up against heat or fuel spillage. A plastic paint by VOR, transparent to ultraviolet the action of jet engines but it is now able to hold color after repeated applications of heat. The CAA will study the merits of a hot extruded plastic marking.

For several questions the group does not anticipate a near-term solution. It is, however, that the issues would be valuable at maintenance and service areas and as a protection to buildings and populated areas.

A substantial increase in fuel storage capacity for aircraft in the group. It is recommended that the storage problem be studied jointly by the Air Transport Association and the American Petroleum Institute. The group wants AITA to determine capacity needs and the AITA to advise on the development of systems and equipment.

In a survey of safety, the group learned that almost no run facing separation is working, particularly among foreign airports. The group is planning a study of the development of fuel also as well as usual and because of the low reliability and the large quantity of fuel that can be dumped to reduce weight for an emergency landing, immediately after takeoff, it was urged that maximum altitudes be established for such procedures.

The group also asked non-passenger service tests on all new aircraft before introduction of any new equipment. Scheduled cargo operations were suggested in a service testing room.

## Satellite of Magnesium

Russels & Poulos, Inc., located at U.S. Navy contract last week to manufacture the satellites for Project Vanguard. The Detroit company will also use the earth satellites from magnesium, a lightweight alloy of two iron- and 12 lead elements, to be mounted on a launch vehicle during the 1955 International Geophysical Year (AW July 2, p. 10).

part of a remote observation transmitter and a timing mechanism (each element within a single flat, in fact, made a reflected lamp range across the remote area, a 200-ft. roll of 70 mm photographic paper).

•Sensitive winged recorder under the VGR but capable of returning a high sensitivity film for unexposed film, a 200-ft. roll of 70 mm photographic paper.

•Turn angle designed by the NACA that records on a 50-ft. roll of photographic film and records the aircraft's rate of pitch.

•Tailcone recorder developed by the Wright Air Development Corporation in Dayton, Ohio, Model 101, the instrument records indicated air speed, pressure altitude and normal acceleration on microfilm paper.

Improved equipment scheduled to be added to the U-2 after development work is completed on an automatic recorder for accurate measurement of air speed, as improved water temperature probe, a vortex probe for measuring flow, air temperature and relative humidity, instruments for measuring visibility and turbulence measuring and recording equipment.

Time free air temperature will be recorded by the U-2 through the use of a series of instruments (MIL-10 AMQ-1) developed by the Naval Research Laboratory. The system is capable of measuring free air temperature with an accuracy of 1°C.

Indirect free air temperature and indicated airspeed, however, will be measured with a temperature/humidity measuring set developed by the Evans Signal Laboratory, Belmont, N. J. The system has a monaural system of approximately 100, a precision humidity measuring temperature and a certain step for measuring humidity.

Pressure altitude will be measured by a precision pressure transducer.

Both the temperature/humidity measuring system and the vortex thermometer have been used to convert their electrical output into a KS-4 Anemograph system for automatic recording.

# Missile-Bearing Helicopters Proposed

By Claude White

Washington—Development of missile-bearing helicopters is being proposed for the U.S. Army in part of its program of increasing mobility with "helicopter" artillery.

At least one manufacturer—Dunham Helicopters of Danbury, Conn.—has announced a design for a conventional version of a helicopter for use as an aerial firing platform for rockets, its rocket and machine gun. A regular version of the model, the Dunham YH 11, was first dedicated to the Army for service tests about two months ago (AW May 14, p. 11).

Studies conducted at the Artillery and Coastal Missile School at Ft. Sill, Okla., have centered around the Sikorski HO-4 and H-34 configurations as well as the tandem Bell H-19.

Remotely fired and eight-inch guided artillery missile armament has been proposed for the smaller aircraft. Designs have been made for installation of launchers to house the 25-inch guided artillery missile and the Honest John on the tandem helicopter.

Basic concepts of the design are described in the Army Aviation Digest by Col Charles W. Mathews, Jr., assistant director of the Department of Tactics and Combined Arms at the Ft. Sill school. Col Mathews was in print.

"It is immaterially evident that our Army will soon have amphibious tactical units, with aerial vehicles, including rocket vehicles. This will enable troops to operate on the ground but move through the air. These amphibious units will range in size from infantry and artillery battalions to a whole division, and they will move through the air in their own helicopters."

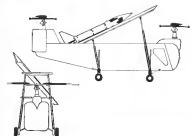
Col Mathews' experienced "artillery" artillery equipment" would be equipped at the water with the 100mm howitzer modified to reduce its weight and bring the total weight to about 10,000 lb. A lifting eye would be provided to facilitate hoisting the howitzer with a helicopter sling.

The current table of organization calls for the requirement for 61 officers, 158 warrant officers, 827 enlisted men and 185 helicopters. The helicopters would be divided into 43 reconnaissance units, 12 utility helicopters, 44 one and a half-ton helicopters and 19 three-ton helicopters. The requirement would have a headquarters unit and three artillery firing units.

In an estimate of probable costs, Col Mathews discounts heavily the value of depending upon air force fixed-wing planes for more air support, relying upon its 18,165 men in the Army. In this



Sikorski HO-4, payload, descent, weapons, superstructure removed, for extended missions.



Bell H-19 is platform in design for hydroplaning and hover for extended missions.



LAUNCHER for 20mm guided artillery missile is suspended on side of H-19 model.

## Lockheed U-2 Makes Data Flights

Washington—Lockheed's recently announced U-2 flight test beds (AW May 7, p. 37) already are conducting data flights, data flights from the Air Force, Government's Waterbury Strip, Nev., and a USAF base in Lukeville, England.

The submarine aircraft, believed to be at least, straightening design, are paving the way for future jet aircraft operations by testing the effect of gust loads at 50,000 ft. and above.

Specific research goals include meteorologic information about dust and turbulence, microwave clouds, and radar and jet stream.

In addition, the aircraft are collecting information concerning enemy radar and the concentration of various elements that appear in the atmosphere, including ozone and water vapor at the upper end of the Air Force and under the direct supervision of the National Ad-

visors Committee for Aeronautics in all probability the Waterbury Strip already is testing some of the data flights from the

Dr. Hugh L. Davies, NACA director, and last week that the research aircraft already have proved their value in the "valuable test flights" they have made from there. They are believed to be a total of those U-2s now in operation, and the program eventually will be extended to cover other USAF aircraft bases.

The aircraft is recording turbulence data, especially during air stream tests described by NACA and the Wright Air Development Center. They include:

•VGR recorder developed by NACA with two pressure sensitive elements for continuously measuring indicated air speed and pressure altitude, a light sensitive element for measuring the en-







**FARMER FORMATION** at Tushino fly-by clearly shows twin tail pipe configuration and split inlet for two engines. High degree of sweep



back is evident in this head-on photograph.

**ONE OF THESE DESIGNS** evolved to Sukhoi. This has partial delta wing, high wing, forward set at least halfway out from fuselage, and variable area inlet.



## Latest Russian Aircraft Display Design Details

**SUPER FARMER** with sharp sweepback, resembles ordinary Farmers, but is noticeably larger.

**ARMASLT CEMRAT TRANSPORT** designed by Arbatov, has gamma in enclosure where delivery tail boom. It has two turbo-prop engines.



**SLIMMER FUSELAGE LINES** of latest Yakovlev all weather fighter are caught in pictures which show sharply pointed radome and . . .



**ROMANOVICH HOSE**, suggesting that this aircraft, a development of the Flitlight, is adaptable as a light attack bomber.



are more advanced than the ones seen in production on the party's list of an aircraft from the Soviet Union. The Americans now are not shown any developments in this field, they were told by designer Andrei Topolev that the Russian Navy's leaders are engaged with similar projects. The Russian party's costs are more powerful than are displayed at the academy.

At a second school, the Moscow Air Academy, the party had a glimpse of how the Russians train young officers in a classroom setting on operations, tactics and doctrine of an aircraft.

Featured at the school was a training lesson demonstrating an air attack on a navy (presumably U.S.) carrier. In addition, the school also has models of the USAF B-52, F-100, F-101 and B-80 as well as a model of the U.S. Navy carrier Franklin D. Roosevelt.

There was evidence that nuclear warfare tactics are being studied at the school.

While the Americans were not shown the quiet reactors and powerful Ramjet engine and airplane plants, the ones that they did see indicated a high degree of ability to apply mass production processes and techniques.

#### Soviet Assembly Plant

At a Moscow airplane-assembly plant, the USAF experts made three observations, which they say then discuss are typical of the Red's best effort:

- Work force of 5,000 had a high experience level. There was good production scheduling, and the plant produced good quality products despite a high proportion of handwork. Lack of automation and high production testing and process held down production per man-hour.
- Assembly pits are light and simple. Welded sections are used in such places as landing gear instead of forgings on extremely used in the U.S.
- Carved sections are fabricated from sheet aluminum as simple hand-operated light hammers. Milling and turning sections are built up by fitting small parts together.
- Floorkeeping practices are below U.S. standards.

The airplane plant, Gen. Tsving reported, was chosen exactly because it is one of the oldest and not engaged in the manufacture of combat planes. The plant produces B-14 transporters, which are now being phased out.

Gen. Tsving and he was told the plant will be converted to the manufacture of a Tupolev bomber, for bomber transport, the Tu-114. Other Russian sources have indicated that the aircraft is an Ilushin design (AW July 2 p. 37).

In an engineering tour, the Americans saw Russians producing their

version of the British Hawk jet used to power some older aircraft such as the Soviet Il-28 bomber, MIG-15 fighter and MIG-17 Folland fighter. The factory turned out more than 10,000 units for the MIG-15 during the Korean war.

Gen. Tsving repeatedly mentioned his disappointment with the Administration's additional funds for fiscal 1957 and the importance of the research and development effort during his appearance before the Senate committee. He did, however, tell the senators that at times do not stand still. He added:

"The time and consciousness—and the consciousness include both that

we do and what the Soviets do—will undoubtedly bring changes in our own behavior of the everyday question of relative air strength."

In addition to discussing scientific and national observations from his trip to Moscow, Gen. Tsving said his party appreciated the opportunity to learn an opinion of the professional competence of Soviet air officers.

On general impressions, he said, "it was that the command element in Soviet aviation is made up of tough, aggressive, courageous leaders. He also observed the leading designers and production men as 'enthusiastic, vigorous and confident'."

## Navy Programs 47 Missile Ships By 1961, Outlines Seaplane Plans

Washington—The undersigned U.S. Navy will place an initial quantity order for Martin's P6M multi-pet in plans submitted during fiscal 1957 and plans to have 47 missile-equipped ships for the delivery of those carrier task groups by 1961.

The Navy's missile and seaplane plans were outlined before the Senate Appropriations Subcommittee on the Navy. Adm. Thomas S. Connelley, deputy chief of naval operations for air, and Rear Adm. John F. Clark, director, Guided Missile Division of the Office of the Chief of Naval Operations, both testified before the subcommittee. The work schedule, as outlined by Adm. Clark:

- **Eight Taurus** missile ships in fiscal 1956 and 17 in fiscal 1961. The Taurus is manufactured by Convair.
- **Four Convair Torpedo** missile ships were programmed for fiscal 1956. There will be a total of three after fiscal 1957. The Navy will have four in fiscal 1957, 11 in fiscal 1958 and 22 in fiscal 1961.
- **One Talos** missile ship is planned for fiscal 1958. This will be three in fiscal 1959, five in fiscal 1960 and eight by fiscal 1961.

Adm. Clark also reported that the Navy's Talos missile ship is "a great deal more expensive" than the Army's comparable Nike missile because of the more complex requirements for shipboard use.

At present, he said, the Talos unit cost of \$100,000 compares with \$50,000 for the Nike. This gap will be narrowed, however, as Talos production increases.

In the field of surface-to-surface missiles, the Admiral said the Navy now has in question four cruise-fuel carriers and two submarines equipped

with the Chato, Vaught Regulus I missile.

Within the next year, he said, the Navy will be searching out the lines that will produce work (the contract) to build and design in designing ships to carry it.

Adm. Connelley said that deliveries of the Martin P6M SeaMaster are scheduled to begin in the fall of 1955. Flight testing at the SeaMaster, he said, has shown that the aircraft has "equal or superior performance" to competitors.

He estimated the cost of the aerial production type at \$5.6 million. With spares and other equipment, estimated cost of the SeaMaster is \$7.9 million, slightly less than the present production cost of \$8 million for the Boeing B-52 intercontinental bomber.

The Admiral told the subcommittee that the SeaMaster has a combat load and is even of 40,000 lb. and an unrefueled combat radius of more than 1,500 miles.

Subcommittee members also posed the Navy through Adm. Connelley, so much ahead with the development of a seaplane with a performance comparable to that of the B-52.

Adm. Connelley told the subcommittee that the Navy has plans for such an aircraft, but he said that there are a lot of things to be done "before beginning the actual building. He added:

"We are learning a tremendous amount with the SeaMaster (Martin P6M).

"Instead of taking the thing in one big group we would rather take it in several smaller groups and be sure of an air war in the Pacific."

Sen. James Jackson (D-Wash.) said the Navy should be moving aggressively forward, not only with a seaplane B-52 version, but also with an intermediate and long-range bomber. But, he said

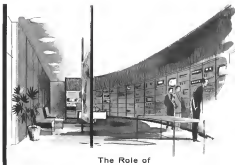
## YOUR WELFARE IS BEING OVERSHADOWED

Our freedom is increasingly dependent upon scientists and engineers, but we are being overshadowed! Since 1950, our need for technically trained personnel has continued to increase, while the enrollment of new engineering students has declined sharply. This critical shortage threatens our future security! For America to maintain its national and industrial leadership, now and in the years ahead, more of our talented and creative youth must be encouraged to pursue careers in science and engineering. These fields offer them unprecedented advantages, and at the same time an opportunity to serve their country!

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R-W Data Reduction Center now under construction



## The Role of INSTRUMENTATION and TEST EQUIPMENT in Systems Work



Data reduction under construction will augment the Division's data reduction facilities



Instrumentation development

The complexity of modern weapons systems, as well as current electronic systems for military applications, is such that the design and installation of instrumentation for obtaining experimental data and converting it into usable form has become a highly specialized field of technology.

A closely related field is that of test equipment needed for the alignment and maintenance of the end-product hardware, both in the manufacturing plant and in the field. Experience has shown that the effectiveness of a major new system frequently falls short of its potential because of deficiencies in the test equipment supporting system.

In The Ramo-Woodbridge Corporation the Electronic Instrumentation Division has the means of bringing to the area of instrumentation and test equipment a level of competence that is adequate to deal with the often very difficult problems that need to be solved in such work.

Assignment undertaken for a number of government and industrial customers include such diverse projects as flight instrumentation, data reduction equipment, and transmission and television of field test equipment for all Division's area of testing. The Ramo-Woodbridge Data Reduction Center with a system and management of equipment certified designed to meet the company's specific requirements. Also in progress is the development and fabrication of field test equipment for an electronic system R-W now has in early production.

A unique and important feature has been incorporated into the services offered by the Electronic Instrumentation Division. For each project, an advisory committee is established composed of experienced systems engineers from other divisions of the company. By periodic reviews such advisory committees insure that the development work of the Electronic Instrumentation Division takes into account the very specific and often not well understood needs which arise in systems work.

Further information about the R-W activity can be obtained by writing to the Electronic Instrumentation Division.

## The Ramo-Woodbridge Corporation

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## Pacific Missile Facility

Washington—The U. S. Navy has just announced that it will use its Air Force facility for a target-drones and guided missile training program at the Pacific. The site will be located at the Pacific Missile Facility, Naval Air Station, Fort Belvoir, Calif.

Construction will be for a \$500,000 building and maintenance program at the base, which is 110 miles from Fort Belvoir. It will be staffed by five officers and 80 men in rotation from the Naval Air Station at Fort Belvoir, Calif.

When in full operation, the facility will be target drones for Navy missions at sea, and missiles launched from ships will be recovered at Fort Belvoir. The drones will include an improved model of the Chance Vought Regulus.

could be applied and refueled at local bases, joined the world by atom-powered submarines.

Sgt. Stuart Strimling (D. Mo.), sub-contractor chemist, added Adin Carls.

"There is no reason why a jet plane could be involved in load-carrying capacity, range, speed or altitude any more than a land-based plane is there."

Adin Carls said they was not. Later, the Adin said the submarine with a long-range airplane bombing force would have these advantages:

- "Would be most difficult for an enemy to locate and destroy because of its mobility."
- "Permit the application of a variable range capability and, at the same time, certain the approach, by changing the scope of nuclear attack on targets of land interest."

"Against our earlier thinking, however, in adding additional pressure on the potential area of the U. S. & R."

There would be, Adin Carls said, 10 first advantages "with no penalty for maintenance or in the case of breakdown, as abandoned on foreign territory."

## Huge Atomic Airliner Expected in 20 Years

A craft which weighs a million pounds and powered by an atomic engine is a "not unreasonable" expectation within the next 20 years, according to a paper prepared by the International Civil Atomic Organization for delegates to ICAO's Caracas assembly.

Supporters of the atomic jet are capable of handling loads ranging up to 1,000 tons, the paper said, and of accommodating a wide range of landing and takeoff speeds and angles.

## Boeing 707 Lands at Los Angeles For BOAC Group Sales Flight

Los Angeles—In a rare instance, documentation of Boeing airplanes did not wait until the 707 jet landed at its port of origin in Los Angeles later today for the plane's first landing at a commercial airport. Previously the plane had landed at Bellingham, Wash., and at D. C., and at O'Hare AFB, Chicago, in its role as a prototype of the KC-135 jet tanker.

The 707, with its unique slanted up and down fuselage, circled, came to Los Angeles to pick up a 10-man British Overseas Airways Corp. evaluation team which had been at Douglas Aircraft Co. in Santa Monica to discuss possible purchase of jet airplanes. The team, headed by A. C. Campbell-Dale, BOAC, concerned the acquisition of jetliners to Seattle for flights with Boeing commercial jetliners. The Boeing 707-320 retrofitted jet tanker, and discussion of delivery dates, a very important factor in the British airline.

With Boeing president A. M. "Tex" Johnston at the controls, the yellow, brown and silver transport gave an indication of its ability when, full way on its base leg to the right margin of a parallel run at Los Angeles airport, the crew ordered a turn back to the left hand strip. The huge plane, with gear and flaps down and slowed to a base leg speed of about 160 kts., made a sharp, quick, 45-degree turn to the left hand strip, where it came to a stop.

Landing at a gross weight of 172,000 lb., with the temperature at the high 50s, the plane added 4,000 lb. to its weight, took a short taxi to the gate, and then, after a short taxi, it took off. The plane came to a stop at the gate, and then, after a short taxi, it took off. The plane came to a stop at the gate, and then, after a short taxi, it took off.

There was no sign of dust at either the gate or the taxiway, and the plane's landing gear was not damaged.

None during the pattern, approach, landing and taxi, but some minor dust clouds had been expected, but none came at parking bay 100, low.

About 200 Wellwood Field, Boeing executive vice president and his staff, including a group of 10, were on hand. Although previously a show flight, the airplane was maintained for certain external pressure studies and other more investigation.

The craft was parked at an American Airlines loading ramp. Various passengers, waiting for board aircraft, were shown through the airport. The aircraft was parked at an American Airlines loading ramp. Various passengers, waiting for board aircraft, were shown through the airport.

from the 10 airlines operating out of Los Angeles, most of whom will be flying the 707, insured against the plane, plus the cost with ground crew. Ground crew also met near the aircraft, checking everything they could.

After a short wait at the American ramp, the plane was towed to an end of the way place on the field, but from there to takeoff at 6 P.M., the plane continued to be a center of attraction for many more visitors who were shown a flight.

The flight from Seattle was made in 1 hr. 57 min. for a black-tailcock speed of 440 kts. Flight altitude was 31,000 ft. with a headwind of 70 kts. Takeoff weight at Seattle was 179,000 lb. The plane carried enough fuel to last 10 hours, and it was a very good try. It flew from Los Angeles last night, after about 4,000 lb. was taken. The plane left from the runway like a passenger transport, rather than with the kind of attitude of the British airline. A very strong, heavy landing at place.

In a press conference during the plane's stay, Johnston and Beall outlined some of the 707's features as a transport.

- Fuel capacity present was, due to that of today's DC-7 and Constellation.
- Holding pattern speed of 160 kts. clear, and 440 kts. with 30 degrees of flap.
- Cruise pattern speed (reduced in climb) of 440 kts. (the 707's) very close to that of current jet-powered transports.
- Fuel capacity good just one hour later than the DC-6B.
- Rate of descent of 14,000 ft. per minute at 10,000 ft. or below, or decompression at other altitudes.
- Takeoff roll of 9,600 ft. on a 100 degree run.

All these characteristics, Johnston said, were for the 707's, a 100-degree climb, with a takeoff gross weight of 200,000 lb.

While in Los Angeles, BOAC's Campbell-Dale acknowledged to Aviation Week that his company will announce a decision regarding the purchase of jetliners for its fleet.

While in Los Angeles, BOAC's Campbell-Dale acknowledged to Aviation Week that his company will announce a decision regarding the purchase of jetliners for its fleet. He said that his company will announce a decision regarding the purchase of jetliners for its fleet. He said that his company will announce a decision regarding the purchase of jetliners for its fleet.

# AIR TRANSPORT

## Airlines Reach New Growth, Profit Peaks

Healthy year indicated by traffic and revenue records set by the airlines in first half of 1956.

By Craig Lewis

Washington—Traffic and revenue records set by the scheduled airline industry in the first half of 1956 indicate that this will be a year of substantial growth for carriers with profits leading the way.

Capacity advantages are a factor in keeping the industry's growth below the phenomenal pace of the 1955 boom, but the resulting improvement in load factors indicates that profits will outpace revenues and traffic.

The nation's trunk airlines operated 10.5 billion passenger-miles as the first six months of 1956, moving about 13% ahead of last year's traffic. Revenues reached the \$615 million level.

Gains made by the international carrier indicate they are on their way to a 20% growth this year. Load factors are improving their pattern of steady, substantial growth with a 25% gain in traffic during the first half.

### Profit Prospects Bright

Although the industry won't grow quite so fast in 1956 as it did in the extraordinary 1955 traffic boom, this will be a more assured, more stable growth year for the airlines. And, while the current traffic won't grow so fast, their profits will.

The second half of the year shows promises more traffic than the first half, and profit prospects look bright.

When the important summer traffic season filling the long-lead reserves of the freewheeling. Since capacity will not expand as aggressively as in the summer, load factors should improve this season.

Results in the first half reflected shifts from a first quarter that was disappointing to more activity opening in the Northeast-Capital, American, Northeast, Colonial, Midwest, Allegheny. They were hampered by the worst weather in years. Western Air Lines was grounded 37 days by a strike.

To a large extent, airline prospects rest on the general prosperity of the nation's economy for its impact. From mid-July to the end of the year, profits are looking off of business activity in the third quarter and on optimism in the fourth quarter. Profits are at an upturn at night occasion in the third quarter have disappeared, and economists have developed a more optimistic outlook on the rest of the year.

Along with general economic prosperity, the airlines view the expanded capital spending plans of U. S. industries as a favorable factor in traffic development. The McGraw-Hill Economics Department says that industry plans to spend \$39 billion for new plants and equipment this year. To the airlines, this means increased numbers of cabins, engines, and technicians traveling around the country.

Approval in Congress of a new \$35 billion highway program is another development which means more business for the airlines. This tremendous expansion of the highway industry will make more use of travel by automobile, and engineers who are working on the program. Most of this business traffic travels on four-lane highways.

The Big Four—American, Eastern, United and TWA—made greater traffic gains in the first half than the smaller trunk airlines. Passenger-miles for the Big Four increased 14% while the smaller carrier's traffic increased 8%.

First-class traffic is continuing to maintain a steady growth, but coach traffic has lost some of the dynamic growth of its earlier boom. Coach traffic isn't growing in fact, but it will continue to expand in spite of the market and is now approaching 90% of total traffic.

### Coach Expansions

The most significant factor in coach operations in the first half of 1956 was the expansion of services by American and United Airlines, which introduced the first DC-7 coach in May, added 134.3 million coach miles in coach service last May, as compared with 112.8 million in May of 1955. The carrier said 112 million coach passenger-miles in May, 1956, and 90.5 million in the previous May.

United operated 191.3 million coach passenger-miles in May and added 325.6 million passenger-miles as compared with 141.4 million passenger-miles and 96.1 million passenger-miles in May, 1955.

Eastern and TWA, which have long been purveyors of coach service, also registered gains in coach traffic. Among the smaller trunklines, carriers that acquired new long-haul routes in recent months increased their coach business substantially. Delta, for example, increased coach seat miles from 51.7 million in May, 1955, to 54.7 million in May, 1956, and increased coach passenger-miles from 24.2 million to 31.5 million in the same period.

The profit picture for the trunk airlines has improved in the first half in spite of the pressures of a tight spread between fares and expenses. Many carriers reported a profit for the first time in years, but they began a slight dip in the first quarter and increased 1956 while revenues were increasing 13.5%.

The key to expanded profits lies in the increase in load factors (see box p. 39). As load factors moved upward

### Domestic Trunk Airlines Passenger Load Factors

	1955	1956
January	80.1	81.7
February	80.1	80.6
March	80.1	82.3
April	80.6	86.6
May	89.7	89.1

through the winter, the gap between revenues and expenses widened, and profits became accordingly.

A general shortage of capacity has developed this year and has been the main factor in boosting load factors. The trunklines are in one of their periodic cycles where traffic growth is in excess of capacity.

The last big increase in capacity occurred two years ago when the airlines started putting the DC-7 into service. Since then, the carriers have been building traffic to fill the new capacity. Now the traffic growth has outpaced capacity growth, and load factors will be high and another heavy round of transport rate hikes takes place next year.

### Re-Equipment Problems

The present capacity squeeze illustrates the re-equipment problem of the airlines. Since transport aircraft have a 10-month life, they can be replaced only once a year.

Since the carriers are not able to provide new service as the traffic develops, they also must make transport ships traffic waiters at the time to keep costs down.

As a result of this approach to providing new capacity, the airlines are not getting much new equipment now, but they will need a considerable backlog in September. Braniff Airways, American Airlines and Western Air Lines will get new aircraft in the fall, and Capital will receive 19 new Viscounts in the end of the year.

The airlines will receive large amounts of aircraft after year end and mid-1956, when prices for jet and turbo-prop aircraft are expected to rise. Another round of orders for piston transports may extend the deadline past mid-1955 if the airlines decide delivery schedules for piston transports are more optimistic than realistic. The carriers may have to order more piston-type capacity to handle traffic in the 1955-56 period if the jet doesn't meet their delivery schedules.



B-12 order placed at Vickers B-12, more powerful development of B-12 with space not needed tail in background.

## Aeroflot Operation Geared to Growth

By Robert Hets

Moscow—Vladimir Arputin, about 30 miles north of here, is the hub of Aeroflot's domestic and international operations and a good place to observe the current Soviet airline picture.

During four visits to Vladivostok in eight days, we always found the public air line crowded with passengers. At least 100 B-12 and B-14 jets were on the field plus three Tu-104 four-engine transports, three B-70 two-engine and cargo planes at least 10 DC-7 types known as the L-3 and a B-70 type known as the L-3 and a B-70 type known as the L-3 and a B-70 type known as the L-3.

These planes all were in the active Soviet fleet and most of them were scheduled during a 24-hour period. In

addition, there were at least another 20 B-14 transports in the Aeroflot fleet, some of which were being used for cargo, including rubber in Japan and sugar in China.

The Vladivostok terminal building is small, but serious standards but handles a steady stream of passengers, mail and cargo on a round-the-clock basis. There are only four arrival and departure times per destination, but they are set down early. Traffic flow appears just as heavy at 4 A. M. as it does at 4 P. M.

### Luggage Passed Unopened

There is no air of armed vigilance about departures. A public official as soon as someone arrives and departs, but there is no gate check of passengers at their check-out the ramp and board their planes. Not one boarding pass was issued at Aeroflot's Vladivostok airport, a boarding pass was issued for the Aeroflot flight to Moscow. But at the border station at Riga, the passenger

and custom check men performed a job largely passed over.

Only a declaration of foreign currency was required. It is illegal to carry Russian rubles, but passengers are supposed to declare their foreign currency in order to take it with them as it is. Actually, border guards at Riga didn't bother to check these currency declarations at all.

Aeroflot is strong here to make a good impression on its foreign passengers. It has multi-luggage personnel at Riga to avoid passengers through the border routine. A stewardess has been added for flights to Scandinavia, the new ones a flight prospects report in Russia and England. A number of the new planes are armed and longer are distributed by the stewardess before take-off and landing. Seat belts have been installed, but they appear to be made for the use of foreign passengers.

Flights allowed passengers to expect

### Domestic Trunk Airline Traffic January-May 1956 and 1955

	Revenue Passenger-Miles (200)	Jan-May 1956	Jan-May 1955
American Airlines	1,873,356	1,810,174	
Eastern Air Lines	1,412,112	1,408,094	
Trans World Airlines	1,583,119	1,503,301	
United Air Lines	1,894,500	1,808,777	
Subtotal	6,763,094	6,531,546	
Braniff Airways	260,719	245,305	
Capital Airlines	251,621	247,029	
Colonial Airlines	30,273	29,607	
Continental Air Lines	92,795	92,656	
Delta Air Lines	478,465	432,467	
National Airlines	463,849	435,285	
Norfolk Airlines	28,248	25,444	
Northwest Airlines	114,630	108,528	
Western Air Lines	102,139	101,249	
Subtotal	2,155,472	2,038,053	
GRAND TOTAL	8,918,566	8,569,600	



## FASTER FARTHER HIGHER

The development of guided missiles of every type is becoming one of the most competitive areas in our world today... for supremacy in this field one will determine peace for many years. This race is now far greater speed, higher altitude, longer range, more sensitive control.

The strength of Western defense lies in a great extent in the development for the Armed Forces of these new weapons systems started in the superionic age. The most deadly weapons, satellite gun and rocket are being superseded by complex weapons of great ingenuity.

Canada has long had a prominent role in Canada's guided missile program, applying the knowledge acquired in years of experience in advanced aircraft systems engineering... and Canada's research, engineering and manufacturing resources are constantly making further important contributions to projects in this field.

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may be necessary in a couple of years. In 1960, about 84,000 passengers used the facility on their way to or from Newark.

The terminal, incidentally, houses Trans World Airlines' reservations center for the east and American Airlines' ticketing and regional reservations from LaGuardia to the terminal, westward to the south. Delta Air Lines, Braniff Airways, Allegheny Airlines and Mohawk Airlines also handle their Newark operations from the facility.

### Public Opinion

When Newark Airport reopened after the 1952 closing, the airlines faced a climate of public opinion not conducive to unlimited confidence in the future of the field. Some of the fears have been understandably common in building Newark, schedules with how new housing at the New York airports.

The community relations problem at Newark seems to be under control and somewhat in 1954 against the airport as a public nuisance, and seeking to capon operations, is quiescent. Plans for the next are the Mayor's Committee, Inc. (Mayor of Newark, Louis F. Rubino and others) and individuals. General Headquarters were seen subject, the Port Authority, the Civil Aeronautics Administration, and the United States of America, but all except the airlines have been largely eliminated.

The airport's most vocal critics, Mayor C. Donovan-Farrar, an official in charge of the airport, former mayor of Newark, present chairman of the Mayor's Committee—closed with N. J. Governor Robert M. La Follette, airport hearings last year and almost was expected from the closing move.

This new station Braniff and Delta, come into Newark last February as a result of the Southeast-Northeast Service Conference of the Civil Aeronautics Administration. Both are happy, although lack of space at LaGuardia and Idlewild eliminated any question of choice of airport.

### Texas Geography

Braniff now operating these daily schedules at Newark, is making Texas an effort to convince Texas that New Jersey, in this case, is a more convenient New York. With delivery of DC-7C equipment by October, the airline plans to split its operation between Newark and Idlewild, adding a fourth flight to the west so that two will be operated at each airport. This Braniff hopes to get a shot in the door at Idlewild, but at the same time keep in Newark service and eventually expand it as the selling problem is solved.

Delta, like Braniff, has experienced a good land factor in its long-range flights through Newark, in less than

fact, had been on the short-haul leg, as Newark to Philadelphia and Baltimore. Delta's flight of Newark, with three daily flights, now schedules seven. The airline's business has split about equally between New Jersey and New York points.

If Delta is awarded the New York to Newark route, the airline's business will be split about equally between New Jersey and New York points. Delta, too, is anxious to get into Idlewild when facilities are available so as to increase the scope of its area business. But the airline expects continuing expansion at Newark, in itself.

Of the carriers leaving Newark, in addition to one or both New York airports, Eastern's commuter route based on the New Jersey field. The carrier's base at Newark, has been declining, and in fact Eastern is concerned, the sales job there has been accomplished. Closing to handle 40% of the airport's traffic Eastern operates an average of 34 daily flights at Newark, compared with about 16 at each of the other fields.

United, with 15 flights at Newark, 16 at LaGuardia and 12 at Idlewild, took that Newark's future is assured. The airline plans to occupy a new 51 low-rise terminal at Newark, under construction by the Port Authority. The hangar is the first to be built at Newark since World War II.

### Favors LaGuardia

American, entrenched at LaGuardia with a fabulous 119 daily flights, is warning about at Newark, with 20 scheduled now operating daily there (and 23 at Idlewild). American doesn't feel that Newark is so well equipped with large-scale facilities. But the airline forces a proposition before the New Jersey field and will stay up there as long as it can or so.

Trans World Airlines has added to its scheduling "New York-Newark" after 11 daily, most of those in Metro-404 equipment. TWA operates 34 daily domestic flights out of Idlewild, 17 at LaGuardia.

The Civil Aeronautics Administration charged that "two areas previously segregated to coordinate functions" in matters of air traffic control. He said that if the Civil Aeronautics cannot resolve an difference after hearing both civil and military requirements, "the should be final."

Lowen also reported that CAA has been negotiating with Boeing Aircraft "for some time" to obtain a 707 jet transport for use in subcontracting to service its own operations. This would, the CAA, allow Boeing training flight and maintenance crews for the new B-57 and two B-47 jet bombers at Idlewild to come from the Air Force. The three aircraft are scheduled to be placed in operation within 90 days.

of the New York area traffic by going into Idlewild too. But Capital plans to stay in Newark with at least 25 or 30 daily flights, even after facilities are available at Idlewild. It is now negotiating with the Port Authority for such construction of a hangar at Newark.

Lowen also serves carriers, Allegheny and Mohawk, serve the New York City area through Newark. Both were there before the field closed and returned when it reopened.

The airport is also served by New York Airlines, Allegheny, and Flying Tiger Lines and Slick Airways on the all-cargo field.

## Lowen Defends CAA Airways, Airport Plans

Washington—Turning the U. S. air navigation system the world's finest, Charles Lowen, Civil Aeronautics Administrator, said today that the agency last week that "it will be able to meet the problems of the jet aircraft when it is ready for civil operations."

Touting before the House Government Operations Subcommittee, with four other CAA officials, Lowen strongly defended CAA's progress in airways and airport development. He called the five-year airport improvement plan the "greatest airport program in history," but agreed with Subcommittee Chairman Robert M. La Follette (D-W. Va.) that the plan could be "misused" into three years.

Lowen also said the area of activity of the Technical Development Center should be broadened.

The center, he said, should be strengthened in terms of money, facilities and staffing.

Lowen described the Air Coordinating Committee as a "succession" and "a success" in the past. He said the committee is "just one of those things we must live with" and "if we did not ask it AEC, it would still be with us under another name."

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## Airline Traffic—May 1956

	Revenue Passenger Miles	Revenue Freight Miles (000)	Load Factor	U S Mail	Express	Freight	Total Revenue Per Mile	Per Cent Revenue to Available Ton-Miles
<b>DOMESTIC TRUNK</b>								
American	687,789	403,499	68.43	1,288,009	799,098	5,392,357	46,495,318	59.80
Boeing	15,642	60,865	60.84	33,450	1,886,618	889,082	6,262,260	54.12
Capital	292,223	58,049	26.86	985,556	180,436	387,817	8,951,609	48.00
Colonial	36,128	6,637	18.31	1,658	7,317	31,394	855,039	45.61
Continental	343,939	31,600	30.39	14,409	27,897	799,134	1,843,468	46.10
Delta	471,648	29,870	40.71	3,463,618	149,054	966,310	16,192,154	53.79
Eastern	556,172	395,560	59.97	964,416	988,313	7,038,894	68,823,179	68.83
Midwest	123,023	68,588	70.66	244,729	45,045	376,290	1,847,170	68.78
Northeast	47,700	9,371	19.58	12,943	75,773	38,891	9,911,163	26.25
Northwest	152,123	19,191	24.88	403,678	894,065	603,675	8,883,444	47.74
Trans World	383,128	267,326	63.15	1,094,967	631,370	1,800,561	39,025,386	59.23
United	597,190	361,853	64.06	8,888,274	981,287	3,948,738	87,943,388	56.32
Western	80,990	47,571	60.38	215,832	79,442	184,657	4,447,145	55.84
<b>INTERNATIONAL</b>								
American	9,893	6,300	57.19	10,755	453	699,501	950,853	65.09
Boeing	2,244	3,163	48.49	14,023	81,809	744,119	15,481,119	15.48
Colonial Atlantic	788,476	996	18.35	1,863	—	8,600	998,918	49.84
Colonial	5,191	4,000	80.65	177	1,553	434,760	6,625,000	66.05
Delta	4,424	4,893	38.31	6,538	—	43,324	3,960,115	66.94
Eastern	15,841	22,477	35.80	60,650	7,344	1,253,427	15,233,427	56.88
Midwest	7,969	4,544	48.85	8,374	1,680	95,919	9,530,930	43.09
Northeast	17,101	19,435	39.93	599,516	16,175	815,370	1,945,425	65.09
Trans World	2,834	3,603	63.89	44,007	419,868	1,373,085	1,373,085	37.41
Atlantic	95,494	108,266	56.19	955,242	1,029,899	14,247,384	14,247,384	54.08
Pacific	284,727	69,017	24.08	1,339,600	1,250,465	9,366,388	16,916,388	66.19
Latin America	88,309	89,617	57.74	313,559	3,090,033	11,405,876	11,405,876	33.58
Europe	1,138	12,897	50.53	11,813	347,500	1,877,500	17,877,500	17.88
Trans World	88,975	84,007	61.78	821,193	140,000	6,448,176	6,448,176	73.86
United	3,193	19,366	24.33	107,358	—	68,490	7,099,145	60.13
<b>LOCAL SERVICE</b>								
Albany	35,530	6,075	44.85	3,164	18,777	4,552	609,715	48.57
Boston	75,378	9,455	47.74	2,640	5,964	344,808	48,480,808	48.39
Central	17,523	1,853	30.09	3,852	9,047	189,143	189,143	33.11
Continental	30,368	4,898	46.08	17,717	7,064	67,000	498,437	55.05
Delta Capital	19,809	1,956	19.68	79,648	70,690	180,718	180,718	37.71
Midwest	33,483	3,064	58.11	8,431	8,245	91,081	396,391	55.07
North Central	46,873	1,152	50.61	19,610	80,266	78,439	78,439	44.34
Orlando	17,680	4,747	38.43	1,708	6,766	49,871	49,871	79.09
Pennsylvania	30,382	6,870	38.17	14,437	12,615	18,971	596,923	56.05
Swanton	16,390	1,502	45.82	9,989	79,368	399,834	399,834	43.84
Southwest	94,147	4,208	44.82	1,708	4,697	480,795	480,795	45.38
San Francisco	18,479	4,110	40.14	12,764	9,836	16,937	428,399	37.14
San Jose	19,812	3,400	43.35	3,715	8,063	5,366	319,116	30.39
<b>HAWAIIAN</b>								
Honolulu	33,324	5,019	44.58	5,367	113,076	371,357	371,357	57.64
San Francisco	14,504	7,779	47.95	857	1,830	151,398	151,398	46.19
<b>CARGO LINES</b>								
American Air Service*	4,700	70,345	56.53	84,887	5,415,733	12,903,357	12,903,357	78.31
Boeing	4,750	84,348	59.23	70,345	4,471,536	8,918,678	8,918,678	76.98
<b>HELICOPTER</b>								
New York Airways	3,765	71	61.91	1,045	1,343	693	9,037	63.64
Los Angeles Airways*	—	—	—	—	—	—	—	—
Helicopter Air Service	—	—	—	8,694	—	2,686	44.13	—
<b>ALASKA</b>								
Alaska Airlines	6,399	1,012	37.39	43,347	976,699	743,790	743,790	43.18
Alaska Central	4,487	475	65.68	4,551	4,082	20,854	20,854	67.85
Boeing Airways	334	34	34.58	570	887	4,778	7,897	78.97
Continental	1,464	1,753	39.17	3,753	129,313	160,383	160,383	53.43
Elis Air Lines	6,117	991	59.71	8,017	3,076	38,917	68,917	67.37
Northwest Consolidated	1,590	456	41.68	15,774	367	81,524	186,840	74.83
Pacific Northern	17,499	8,956	39.85	19,465	215,745	146,731	146,731	68.31
Boeing Alaskan	735	378	38.85	15,818	—	33,540	88,163	39.59
Wien Alaska	8,387	1,073	18.54	25,054	—	1,743,096	1,743,096	99.49

\*Not available  
Compiled by AVIATION WEEK from airline reports to the Civil Aeronautics Board

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# New G-E Turbostarters give fast starts without ground power assistance

Sixty-pound unit produces more than enough horsepower to bring the engines of a USAF medium bomber to life speed within 25 seconds—anywhere.

G-E's cartridge turbostarter makes the Martin B-57 one of the first USAF jet aircraft in production to be equipped with self-contained starting power. With the high-speed turbine, the planes can operate from the most adverse bases, even where ground support may not be readily available. At any base, maintenance group take-offs are now possible without waiting for ground power—allowing the planes to be deployed for maximum protection against air attack.

**Speed and Reliability**  
According to E. D. Uhl, Martin's Vice

President of Engineering, "The Martin Company has used General Electric cartridge starters since they were available. Thousands of starts have been accomplished successfully under all types of environmental conditions. This starter gives our Air Force the most rapid engine start available and does ground power free from the burden of handling, repairing, complex starting equipment."

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Integral with aircraft's electrical system means no extra weight. Easy, snap-on job.



## CAB ORDERS

(June 28-July 6)

### GRANTED

**Charger Helicopters Ltd.** authority to fly, any one of 71 Lockheed C-130 Hercules Model 40-10-1 or -10-2 to suit day, late night flights between Seattle, British Columbia, Vancouver, Wash. and Toronto, Wash., for Trans Mountain Oil Pipe Line Co. The authority terminates May 31, 1957.

**Rocky Airlines** an exemption to issue and purchase six C-46 aircraft from Pan American.

**Continental Air Lines** an exemption to continue restricted service between Atlanta and Houston, Texas until July 15, 1957.

**Flag Air Line** an exemption to perform line charter flights in New York from Hamburg, Munich and Athens for the International Committee on European Migration.

**Norfolk Consolidated Airlines** and **Wren Airlines** authority to perform direct operations with Boeing Transport for line of C-46 aircraft until Aug. 11, 1956.

**Wick Airways** an exemption to perform a charter flight from Richmond, Va. to London carrying a ship's crew for Pan Corp. under an agreement with British Overseas Airways Corp.

**Trans World Airlines** an exemption to provide free transportation to rescue crews of Pratt & Whitney and Wright Aircraft for in-flight observation of engine performance.

**American Land Advertising, Pan American World Airways** and **Pan American Cargo Airways** permission to determine in the Transporters Association National general assembly.

**Flag Air Line** an exemption to perform transatlantic charter flights for the National Airlines Club, the Pratt & Whitney Aircraft Club of Southampton, the United States of St. Louis, the Hawaiian Islands Travel Club and the Globe Air Club, Inc.

### APPROVED

**Agreements** involving Northwest Airlines, North Central Airlines and various other carriers, relating to aircraft interchangeability.

### ORDERED

**Arling E. A. Maffeo** to issue and direct his duties as vice chairman of an aircraft control in the cockpit, in which he is a pilot, to issue and direct his duties as a pilot in the cockpit, in which he is a pilot, to issue and direct his duties as a pilot in the cockpit, in which he is a pilot.

**Trans Canadian Airlines' authority** to operate their charter flights for the International Committee on European Migration extended to change the suspension of one flight from Shanghai to Vancouver and to add one flight from Shanghai to New York.

### DISMISSED

**Problems of application** filed by Delta Air

Lines and Trans World Airlines in the Coast Line-Southern Co. at the request of the carrier.

### DENIED

**Arling Transport Carriers' application** for temporary authority to operate between San Francisco, Oakland, Los Angeles, Burbank, San Diego and Tijuana, San Carlos, Mexico.

**Western Air Lines' request** that all passengers working non-stop service between Chicago and Charlotte be served from the Coast Line-Southern Co. and not serve for separate billing.

**Northwest Airlines** and **Pan American World Airways' applications** for exemption authority to receive military cargo operations during July, August and September, 1955.

## Shortlines

► **Air France** carried 402,699 passengers during the first quarter of the year, a 29% increase over 1954 first-quarter traffic. Passengers increased 21% in the first quarter, and the first quarter last year was 71%.

► **Air Transport Asia** reports the scheduled airline operated with a passenger facilities rate of 99 per 100 million passengers during the year ending in May. The rate was 71 for the domestic airlines and 18 for the international and national carriers.

► **Delta Air Lines** has given Lockheed Aircraft Service International a three year contract for maintenance and overhaul of the four Constellation jet aircraft purchased from Pan American World Airways earlier this year. Work will be done at the LASSI base at New York International Airport.

► **United** plans to establish an office in Vancouver and other South American ports within a year.

► **Lucas Aerobus Inc.** has added a new service between Miami and Bogota with two transit flights a week.

► **Mekong Airlines** banded 34,962 passengers in June, a 77% drop from June, 1955 figure. The carrier banded 365,441 passengers during the first half of 1955, an increase of 14.4% over the same period last year.

► **North Central Airlines** carried 55,635 passengers on its system last month, an increase of 20% over June, 1955. North Central claims it is the first local airline to carry more than 50,000 passengers in any one month.

► **Pan American World Airways** has been named the official carrier of U. S. athletes traveling to the Olympic games

at Melbourne. Pan American will fly more than 350 American athletes, trainers and Olympic officials to the games next November.

► **Piedmont Airlines** carried 43,779 passengers in June and 151,441 passengers during the first six months of the year, an increase of 14,574 and 166,544 in the same period of 1955. Load factors were 52.3% for the first six months and 50.75% for June, 1956.

► **Southeastern Airlines System** has increased its trans-ship service between the West Coast and Europe to one flight a day. SAS operates two first class and three tourist flights a week between Los Angeles and Copenhagen and other European points, giving the carrier a capacity of 300 tourist and 250 first class seats a week.

► **Southern Airways** flew 15,934 passengers, 2,132,551 passengers earlier last month, 11% over June, 1955.

► **Southeast Airlines** inaugurated its first scheduled service this month and plans to expand the service to all its Maine 202 flights.

► **The Airways** has ordered three Super-C Constellation from Lockheed Aircraft Corp. The transports will be delivered in the summer of 1957 and will have a combined tourist/first class configuration.

► **United Air Lines** has begun a shuttle service between Los Angeles, Oakland and San Francisco with 11 flights a day.

United's board of directors declared a regular dividend of 37.5 cents a share on shares payable September 15 to stockholders on record August 17.

## Sperry to Make DC-8 Flight Control Systems

Contracts for first flight electronic flight control systems for Douglas DC-8 jet aircraft have been announced. Prototype of a system called the SF-16 is scheduled for delivery by Sperry Gyroscope Co. in the near future. Production models are to arrive by next June. Company says SF-16 will provide precision control between relatively slow speeds of 100 mph and supersonic speeds.

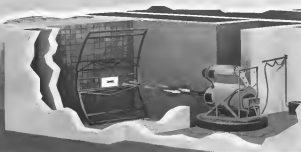
Incorporated in the transonic section are such features as manual path damping, a close altitude and radio guidance control, automatic altitude gear for navigation over long distances, simplified mode interchanging equipment, and safety features to guard against flight disturbances.

Douglas will have deliveries of the DC-8 in 1958. Some 114 of the new craft are on order to 11 airlines.



## Here's How Facilities at General Electric Speed

## Electronic Bomber Defense System Development



**ENVIRONMENTAL TEST CHAMBER** simulates atmosphere conditions found at altitudes up to 100,000 feet



**AIRFRAME EQUIPMENT** such as the engine exhaust being tested here is subjected to severe vibration tests



**DIGITAL COMPUTER**, designed and built by General Electric, is used to help solve airborne defense system problems

**QEMAT (Dynamic Accuracy Tester)** simulates flight conditions and combat situations on an indoor test range, thus saving costly flight tests and reducing qualification time.

Located at General Electric's Aircraft Products Dept., this installation permits single fire testing of electronic bomber defense systems at temperatures ranging from -100°F to 150°F.

## G-E Facilities Help Researchers Anticipate and Solve Problems Prior to Airborne Tests

Cutting lead time in the development of aircraft equipment has become increasingly important. All possible measures must be taken to reduce development and testing time in order to speed delivery of operational aircraft to our armed forces.

General Electric test facilities provide an important means of reducing development time of airborne defense systems. The test facilities pictured here help experienced G-E personnel to analyze and solve

problems difficult or not impossible to duplicate by flight tests. Just as important is the saving in valuable time and reduction in expense of airborne testing. These facilities help make the saving possible—speeding the development of aircraft defense systems for tomorrow.

Engineers. Expanding electronic bomber defense projects at G-E are creating opportunities for you. Contact C. E. Irwin, General Electric Company, Aircraft Products Department, Johnson City, N. Y. 13790.

*Progress Is Our Most Important Product*

**GENERAL  ELECTRIC**



**CELEBRATE 210** handles only one matter. Care must be taken to monitor report time, but hearings can be held within 120 days.

*Aviation Week Check Rate:*

## Cessna 310 Flies Well, Quick on Controls

By Richard S. Courtney

**Wichita, Kan.**—In its light, new executive Model 510, Cessna Aircraft Co. has produced a sensitive responsive aircraft that has performance to spare. It deserves a full complement of light and navigational aids plus professional piloting to take advantage of its high capabilities.

The combination of one, of the, lowest weight-to-power ratios (9.6 lb. per hp) in its category, plus the wingtip tanks, makes the 110 a scramble though in no sense truly mobile to it.

Due to the moment and weight of the big tank, the interior feel of the



**TIP TANKS** of advanced design, channel on flow exit sides wing, useful for greater lift.

110 at last seems to be that of a large airplane. This can lead to the application of more control pressure than necessary to correct for roll in takeoff, landing or steep climb attitude.

It is in the soft area that smooth and steady control pressures are most necessary.

The 410 is an inherently stable airplane, reduced oscillations will damp out if the airplane is properly trimmed. Proper control movements will keep oscillations from getting underway, without undue over-control.

### Maxwell Equations

Kinase of the 310 design is of course. The kinase reaction, for example, are 21 in high acid and then

top surface, generate about 12% of the total lift. The forward part of the lower leg structure, where atherosclerosis prevalence is high, is both rigid and unyieldingly smooth. The top tanks act as atherosclerotic braces to get more lift from less wing area. Total lift plateaus found are on the 310 at 5.8 sq-ft. Design length weight is 2,952 lbs. With 645 lb fuel and oil and a gross weight of 4,600 lb, the 310 has 1,650 lb to be distributed between passengers, baggage, and optional equipment.

In all flight regimes investigated, the airplane performance exceeded overall mission specifications. However, more

main single-curve control speed, plus carried at 93 mph. IAS (indicated air speed) was not isolated.

Alkyd, capablen, and crumming conditions were evaluated and a simplified wet-on-wet approach was made during a field test from Denver, Colo., to the

\_\_\_\_\_

Dick Sweeney

Richard Sweeney of Ashton Woods West Coast Division quit keeping track of his driving hours after putting the 5,000-hour mark. He estimates that his log now would total some 6,000 hours, some included in over 70 types of projects. "I'm a W. A. B. and so on," he says.

Dick has four single and multi-engine personal and executive planes, lighters, bombers, transport and experimental types. The list includes jet aircraft, starting with the Bell P-50A, Mustang.

During World War II he accumulated 1,000 hours of combat flying time in patrol bombers and fighters of the Royal Canadian Air Force. Later he served in the Army Air Force as a fighter pilot in the 44th Glider Assault Group, 14th Air Force in Europe. He also was a test pilot in the flight test section at Wright Field.

Claiming his career continues as "hot" drama, Dick Swaab says, "My story has come from many books, not airplanes." He has current CAA pilot ratings for assets over 12,500 Pts.



**PARALLEL MOUNTED** needles mean less cross sectional drag, and their big surfaces generate 125% of total lift. Engines are mounted on built-in short metal structures (ark). Heavy rubber blowstrikes remove residue from blades.



Cotyledon plant at Wafuta. Other light evaluation measurements were done at the vicinity of Wafuta and Hlongwane, Kam., which are 1,370 ft. and 1,592 ft. above sea level, respectively.

Cruise investigations covered altitudes from 15,000 ft for flights near the sea level cruise, then a climb to 21,000 ft for altitude evaluation. The right engine was feathered at 21,000 ft to ascertain the 500 fpm rate of descent at 100 mph IAS with the remaining engine at maximum power.

Crane weight approximated 3,800 lb at this stage of the flight.

Point-to-point flight time was 1 hr, 35 min., for an average ground speed of 213 mph, including climb. True airspeed approximated 190 mph most of the time at 16,000 ft with 10% margin.

Proper mixture settings and cruising at the higher altitudes combined to give an overall trip average gasoline consumption of 21 gal/disposal hr, a figure around which it is perfectly safe to build a completely V-8 flight plan.

#### Under CAR Measures

Civil Air Regulations regarding light twin speeds that airplanes with a gross weight of more than 6,000 lbs. or a stalling speed in excess of 70 mph must comply with standard single engine inoperative climb requirements. Since the 110 gross lbs less than required, and stalls at lower LBS, it does not have single engine characteristics complying with CAR.

But the 110 has good single-engine characteristics. It can be transitioned hands off, turned into the dead engine with gear down without excess loss of altitude and safely climbing back into or away from the inoperative engine without crew control action.

In translated single engine go around, performed with 4,000 ft at ground

level to compensate for light gross weight, the airplane was towed, to hold on cruise, and when full power was applied to the screaming powerplant for go around, deliberate slowness in clearing up the airplane showed it well climb at 500 ft/min in the wheels-down configuration. Clearing up the stretch gave a 900 ft/min rate of climb. Left-hand traffic was used, with the left engine feathered. Standard pattern entry and leaving tracks were followed.

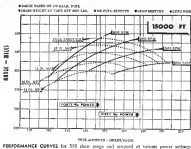
### Light on Controls

As in all cases of single-engine flight, close attention must be paid to keeping proper trim for nose or wing lift control pressures to maintain the desired flight path.

Another unexpected aspect of angle-control control in the J10 is that headings can be held within 1 or 2 deg at an

## Cesura 310

Sym ..... 36 lb.  
 Length ..... 27 in.  
 Height ..... 18.5 in.  
 Gross wing area ..... 373 sq. in.  
 Gross weight ..... 4,600 lb.  
 Useful load ..... 3,700 lb.  
 Wing loading ..... 36.1 lb./sq. in.  
 Power loading ..... 9.5 lb./hp.  
 Fuel capacity ..... 300 U. S. gal.  
 Oil capacity ..... 6 U. S. gal.  
 Performance ..... 2 Continental O-470-M  
                                     @ 240 hp. each, max  
                                     rpm.  
                                     max speed @ 2,600  
 Cruise speed ..... 554 mph (L. Wick



mic feathering with altitude alone, lost on the floor.

The airplane was put through a practice ILS approach at Wichita Municipal Airport. Although the descent rate was opposed with approach computer, a manual approach was used. In this instance, steady and smooth control pressures are important.

#### Stall Warning

In stalls, the airplane entered buffet well ahead of complete stall. Warning horn reaction was frequently more than 10 mph ahead of actual stall. The airplane breaks down in power of stalls, with little or no lateral or longitudinal wandering tendency. Full power application automatically cuts for very coarse turn, but application of cruise power recirculated turn slightly.

Using the stall recovery technique backed by CAA—dropping the nose only to the horizon and applying power—the 310 can effect a power-off stall recovery with less than 100 ft altitude loss from top of the stall. The same technique applied to a cruise power stall yields a 10 to 30 ft altitude loss. Recovery from a power-off stall using standard technique—dropping the nose below the horizon and applying power to reach stall speed as quickly as possible—gives a complete stall recovery in less than 500 ft.

In short field technique, taking advantage of 15 deg flap maximum lift setting, the airplane can become airborne at higher gross weights in 500 ft. Climb over 50 ft obstacle can be accomplished in just over 1,000 ft. If the airplane is cleared up quickly after takeoff, airborne. Minimum flare, low L/D power approach rate is possible for the 310 to be landed and taxi.



FLASH control for area has balanced controls.

off the active runway within 500 ft. At maximum gross weight, both takeoff and landing distances increase some what.

#### Quick Acceleration

The 310 performs well on both take off and landing. The clean design gives quick acceleration, and the airplane becomes airborne quickly. The plane can be pulled off the ground in a heavy ground 65 mph LBS, or it can be flown off gently with light load pressure around 50 mph. No flaps are used in conventional takeoff. The tricycle gear gives good visibility control upward is always in sight.

The standard light twin landing technique is lost with the 310, that of using power on final approach and cutting it at the descent. Flap on, embrace the five deg applied to offset turn change when the gear is located, is usually dictated by atmospheric conditions of wind, temperature, pressure

altitude of the field. Smoothness and an over-control are important on final approach.

Also, two engine airplanes are started with fuel boost pumps on, carburetors in idle cut off. The 310, with its down draft carburetors, reverses this procedure. Starting is with boost pumps off, carburetors full idle. If the engine is slow starting, a shut off boost usually gets them going.

Overloading can happen quickly with this type induction system, and if it is suspected the engine is flooded, it is best to wait a few minutes for the fuel to dissipate before trying the start again.

With the electrical switches set in base, this part of starting is easy. Starter button boost pump in this location are close and easily manipulated in the starting sequence. Gross capacities are an indication of a change of procedure in the solvent oil and boost pump on system, since most pilots are used to that system.

On the ground, the 310 is adequately controlled in the sideways, nose wheel. If severe turns are to be made, brake and engine can be used. With the power available, nose is to be used in using the engine as a driving axle.

Structurally, the 310 has a high aerodynamic pressure structural area (forward fuselage) designed for maximum drag. The engine nacelles employ several unusual techniques.

First consideration was streamlining, wall frontal area and effective cooling. Baking sheet metal structures carry the engines. Essentially the design consists of two circular sections of heat-treated metal, two lateral reinforcing frames and stressed skin sandwiched with a transverse bracket wing into the front wing box as a load transmission structure. The engine is mounted on the structure with heat exchanger bracket type mounts to reduce vibration transmission. In addition, the nacelle structure fabricated as a pig, extends into the wing as nacelle structure, fuselage extending the loads into the main wing.

#### Costs Reduced

Certain fields that overall costs have been reduced by the sheet metal casting process, compared with machine steel in various parts of the structure, such as higher, but when all costs including labor are taken into account, the sheet metal system comes out ahead to us nothing of the better strengthening that would have been responsible for making sheet. Another feature is that collars are integral for strength to take the lift loads generated. They make for easy viewing in that they do not have to be assembled and installed separately.

Engine suspension tubes are used to aid engine cooling. In the latest version of the 310, which has the turbo boost engine heaters, double window

As a representative of this industry, the flight of the 310 is a great public relations step. See page 30, South Atlantic Airlines.

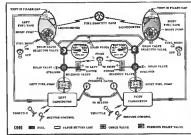
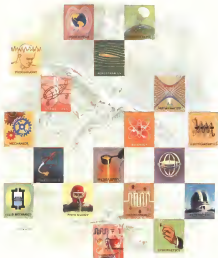


DIAGRAM shows details of fuel system of the 310.

"Who's reach should exceed his grasp, or who's a heavier far"—Robert Browning

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LE-18



INSTRUMENT panel of 310 is flexible, providing space for several combinations, including dual conventional gyro. Flight group is left, engine group right.

are installed to the rear of the passenger compartment to offset the asymmetric mass.

#### Racks Installed

Cessna builds in at the factory all racks for optional equipment, radio and engine, whether or not the buyer specifies any installations. Rack for the Scott oxygen system, a 2,100 psi bottle and regulator which reduces flow to low pressure at the door outlets, is installed behind the baggage compartment. There are racks for master battery disconnect and other radio-electronic equipment, including autopilot. Racks for remaining optional electronic gear are forward of the passenger compartment.

Since the first 310 was sold in 1954, the plane has undergone few major changes. Of these, the majority were for psychological reasons as customer requests, Cessna engineers say.

Near the wings, although no excessive torsional or bending loads were being entered, skin thickness was increased one gauge to avoid giving the impression of more than usual structural weakness. Chaperons were added under the wing skin in the wheel well area to prevent oil running. The starve tire levers did not call for stiffening.

Wings replaced welded canopy rails in the landing gear where it was found that later releases could be achieved with the plane's electro-mechanical system, as well as weight and cost saving. A safety switch was wired into the warning horn system and hooked to the left landing gear. It sounds if the landing gear opening switch is placed in the "up" position

while the airplane rests on the ground. A weight limit switch keeps the gear from folding while the plane rests on the ground.

Cabin door hinges were beefed up and changed to double (top and bottom) locations. Cabin skin was increased one gauge in a vibration reduction zone. One performance factory change involved reducing propeller diameter from 54 in. to 50 in. Smaller props deliver the thrust necessary, and at the same time the prop tips are two inches farther from the ground during engine nacelle.

Continental distributed a modification in the 240 hp Continental 8-70-M engines governing the 310. To prevent accidental fuel leakage, and to drain excess fuel when engines are flooded at starting, automatic drains are placed at the lowest spot in each intake manifold rather than in the central spot where drains did not always completely eliminate air gas in the manifolds and sometimes caused heavy backfires.

#### Fall Panel

Instrument-wise, the 310 comes equipped with a full panel as standard. Optionally, Cessna offers one weather-vortex installation which includes de-icing for wings, tail surfaces and propeller, auxiliary electrically driven gyro light, automatic self-aerated clearance and radio gear (priced at \$33,925).

The demonstrator used in the evaluation carried the company's Cessna LC optional equipment plus a Solo Flight Speed Control Instrument system, with a total installed weight of 165 lb.

Some 70% of 310s delivered leave the factory with approximately \$20,000



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## BUMBLEBEES CAN'T FLY!

You've heard the old story!

Bolt engineers, too, are busy every day solving near-impossible problems related to many phases of flight—important, challenging design and production problems on hundreds of vital, major aircraft components.

One example: The development and production of complex, stainless-steel, honeycomb sections for high-speed aircraft and missiles.

Bolt is harnessing those days with more and more large military and commercial contracts.

Skilled engineers are urgently needed to grow with these big, long-range programs. Young men

are offered outstanding career positions with unmatched opportunities for advancement within this large, fast-growing aircraft firm.

Especially needed now at Bolt are: Design, Stress and Structures, Lofting, Equipment, Electrical, Latent, and Aircraft Industrial Engineers, Thermodynamics, Metallurgists.

Write us today! Let us show our social management policies, personal benefits, chances for quick advancement and other career advantages for you at Bolt in beautiful Chula Vista located on cool San Diego Bay.

Places with giving complete details and we will answer at once.

J. L. Finkel, Industrial Relations Manager, Bolt Aircraft Corporation, Chula Vista, California, Dept. 37

WORLD'S LATEST PRODUCE OF

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AIRMAIL CORPORATION

work of optimal equipment installed, including a Lear L-2 autopilot, radio, dual Aircraft Radio Comm, VHF 15D navigation system, ARC T11B transmitter, Lear LVTR 36 transceiver, Lear ADF 12 or 14 radio compass, Lear 2200 marker beacon receiver, Scott autopilot system, rotating, beacon, auxiliary landing light and tail light. The aircraft gross weight from 228 to 249 lb.

A second popular design containing all the elements necessary for maximum constraint IFR operations costs about \$9,800 and does not have the autopilot, second ARC VHF 15D, or several other items and weighs about 128 lb.

Most individuals or business concerns investing \$50,000 FDB. Weights for a Cessna 310 but that a full crew pleased all equipment for maximum performance makes good sense. Cessna has found that 80% of the 310s delivered are being flown by professional pilots, employed by the owning individuals or companies. Cessna's severe distress reduction of all-weather operation consistent with the initial investment and safety.

The 310's range of better than 660 mi. at average cruising speeds about 610 mph. Cessna investigated extending the range and found that business replace range is ground to have long air miles closer to the shift at one time. Steps for a standard and making up about 1000 miles from seemed to be the perfect solution. For owners who require longer range, the company has developed separate fuel tanks located in the wings.

## PRIVATE LINES

New Learner orders by Sinclair Refining Co. and W. A. Grier & Co. critical M-1 production through February 1957.

Specialty modified DC-3 operated by Herring Corporation Ltd., England, carries a sophisticated, electronic, radio detector and identification counter. All can be operated simultaneously. Not only can the three types of vital data on a subcarrier are deposits be measured along the more light bar, but they can be compared, allowing confirmation of one or more readings quickly, the firm states.

Ottawa no longer allows private pilots who make emergency landings on highways to take off from these areas. In the future, pilots must be told soon, the Ottawa Department of Highway rules.

AirResearch Aviation Service, Los Angeles, Calif., is a distributor for Aerojet General Corp.'s aircraft auxiliary take off rocket motors for installation on

## FASTENER PROBLEM



## SIMPLIFIED FASTENING METHOD

developed for Douglas' fuel-tank access doors

A design for fuel tank access doors, as used by Douglas Aircraft Company on DC-6 and DC-7 airliners, involves a rubber sealed assembly of fasteners in gasket-type clamping rings. Douglas engineers required a threaded, self-locking fastener that would retain the advantages of the basic sealing method while providing a general, safe method of attachment.

ESNA supplied the solution in the form of an improved self-retaining, air-hand-shank-type nut. Developed specifically for such applications, the ND2206 offers these design features: (1) A chamfered pilot on the shank to center the nut and ensure equal seating of the gasket around the installation hole. (2) A deep relief groove to allow actual broaching of the hole and thereby ensure proper seating of the work. (3) Minimum flange diameter for close clearance applications. (4) A counterbore to provide thread length to accommodate "AN" bolts.

The nylon nuts are simply pressed into drilled holes and the entire assembly coated with rubber. (The high availability assured by nylon versus B7ASTIC coated with rubber.)



STOW nuts are, of course, essential to the type of secure door application. Douglas engineers report significant time and labor savings in fabrication and maintenance.

ESNA can provide a practical solution to your most difficult locknut fastening problems. Send coupon for design information.

**Dept. 110-715, Elastic Stop Nut Corporation of America**  
3550 Vantage Road, Union, New Jersey

Please send me the following fastener information:

<input type="checkbox"/> DATA SHEET ON ND2206 SPUNE Nut	<input type="checkbox"/> ELASTIC STOP Nut bulletin	<input type="checkbox"/> How is a drawing of our product? What self-locking features would you suggest?
---	--	---

Name \_\_\_\_\_ Title \_\_\_\_\_

Firm \_\_\_\_\_

Street \_\_\_\_\_

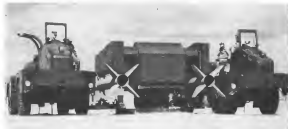
City \_\_\_\_\_ State \_\_\_\_\_





CARGO TRACTOR tows mobile launcher for Convair Terrier to Mines, training site.

## Terrier Is Fired on Mobile Launcher in Marine Training



TWO TWIN CARRIERS on self-drive mobile launcher and towed into position on concrete ramp. No. 10 Marine Corps training with Terrier in China Lake, Calif.



LAUNCHER is carried (left) by M100 on truck. Towed (right) truck on M100 down on launching ramp.



Terrier is fired from mobile launcher.



Explosions of left wing of missile.



Missile begins to burn after launch.



...and quickly disappears.

## NEW CHANNEL Sanborn oscillographic recording system

This new self-contained Sanborn oscillographic recording system, presently the first not based on analog control recording, measures only 48" x 27" x 27". In a single, space-saving mobile package, the user has a complete system for analog computer output recording. Input cable connectors are easily made at the top of the back panel. Each group of controls for the eight channels are conveniently located on the sliding top panel. Driver Amplifier channels are easily withdrawn from the lower part of the console for inspection. Paper handling is quickly done from the top.

Features of the Model 100-5000 system include 0.1 in/sec. to 100 in/sec. sensitivity, overall frequency of 0.25 cps per inch, 4 in/sec. of chart, 4 in/sec. 0.3 sec. delay, multi-lead or single-lead light, analog (tapped dual channel) DC amplifiers of improved normal feedback design, 5 meg. input impedance with input lead to ground, true rectangular coordinate recording, auto chart speeds from 0.15 to 100 inches. Frequency response is flat to 20 cps, down 3 db at 80 cps for all amplitudes in 4 cm peak to peak.

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# TAKE-OFF POWER

## BY PHILLIPS 66

The M15 JATO . . . developed and manufactured by Phillips Petroleum Company . . . uses a solid propellant made from petroleum raw materials.

In the photo above, 30 M15 JATO rockets give a Boeing B-47 Stratojet medium bomber a take-off assist. Use of these rockets permits greater in-flight payloads as well as operation from smaller airfields.

The Phillips M15 JATO operates successfully in the temperature range -75 F to 170 F. Propellant for the M15 rocket is but one in a series developed by Phillips from common petroleum-derived materials such as ammonium nitrate, synthetic rubber and carbon black. These propellants are insensitive to detonation by impact or explosion. Exhaust gases are noncorrosive and relatively low in temperature.

Solid rocket propellants in the Phillips series are readily usable for a variety of rocket applications from small amateur



rockets to very large boosters. Phillips operates extensive facilities for rocket research, development, test, and manufacture.

Can our staff of highly skilled rocket scientists help you solve your complex problems in propulsion systems, primary rockets, booster rockets and related activities? Inquiries are invited.

(Photos courtesy of Boeing Aerospace Company)

### PHILLIPS PETROLEUM COMPANY

Bartlesville, Oklahoma

Address all inquiries to: Rocket Fuels Division, McGraw, Texas.



129-1 TRADEWIND is powered by four Allison T40 turbojets rated at 5,500 each. Overall length is 342.5 ft., wingspan 147 ft.

## Convair Nears End of Tradewind Contract

Final deliveries of 11 Convair F-106 Tradewind, turbojet-powered blended half flying boats, will be completed this year to Navy Squadron VR-1, probably ending use of the very original concept in wing-based aircraft design.

F410 plans for the small production order should be delivered to the squadron this month. The remaining six on the line at Convair's San Diego plant will be rolled out before December.

With no present plans for additional orders, the final delivery will add a bolt to a program which—after long development troubles—finally got out of the weeds.

Both Navy and Convair see a long life ahead for the Tradewind. Some observers have expressed it to the program that produced only one XC-99 fighter modification of the Convair B-56. The XC-99 is still operational much a decade after its delivery, and still is carrying over a cargo longer distance than any other airplane.

VR-1 also operates the Marine Marauder, part four-engine replacement with a twin in its history.

Navy problems with the Tradewind was its intended preconcept, the Allison T40, which the Navy never got around to sponsoring. As substitute, Convair engines rated for the Allison T40 coupled turbo-prop engine made by hooking the power propellers of two T38s into a single gearbox.

But the T40 turned out to be somewhat deficient in power at altitude and in fuel consumption. Convair's blended fuselage with an over-cambered airplane, and for a while, the entire program looked as if it were to go down the drain.

A redesign of the basic airplane was pushed through the San Diego engi-



ON THE STOP, Tradewind shows the sleek lines of the blended half configuration.



FLIGHT DECK at Tradewind shows arrangement of crew positions.





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*Austenal microcast gives you better turbine power wheels more economically, faster*

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Here's why. Austenal makes turbine wheels by investment casting, thus eliminating costly machining and at the same time allowing the use of new high-strength, ultra-high-temperature alloys that are impractical to machine.

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within  $\pm .005"$  per inch, and blades can be of virtually any thickness (down to .020") contingent, of course, upon wheel design and size.

Austenal manufactures wheels in many sizes from two-inch midgates to giants 17 inches in diameter. These wheels are made to the most exacting standards, rigorously checked and re-checked during every production phase to guarantee they are exact — internally sound and externally perfect.

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"Design with Microcast in Mind." Austenal's latest informative booklet, tells you how to get the greatest benefit from investment casting. Write for it today.

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**T80 HACHEL** speed for more than one part complexity of the powerplant.

sewing department, aimed at adding 10,000 lb. payload capacity to the airplane.

The intent was that when bigger would be made to handle them and to have extra payload besides.

Aerobically, the additional capacity just compensated for the powerplant's drawbacks, so that the complex loads made its design specifications.

An experimental version of the R37-1 was built around a low loading door. The entire front of the plane, tipped up to diagnose the contents of the long load.

Then, too, been great interest in this design, denigrated the R37-1, by both Manover and Ames, who see such a concept as possible, the only feasible solution to these amphibious aircraft problems. But interest in one thing and procurement means is another, and so far, all Canada has seen is the interest.

The R37-1 Tracker and is placed in four different T80 turboprop rated at 5,000 hp.

Wingspan is 145 ft; overall length is 142 ft; 1 ft of the wheel is 10 ft; 1 ft of the wheel is 10 ft.

## CL-28 Skips Prototype, Is Near Final Assembly

Prototype stage is to be eliminated in the CL-28, the Canadian aerospace consortium version of the Bristol Britannia, and the first aircraft was meaning final assembly at the Montreal factory in the production model.

The CL-28 is scheduled to fly in early next year with Wright turbo-propeller engines, not turbine engines as in the Britannia. Like the Britannia, the CL-28 will have a wingspan of 142 ft., but the fuselage length has been increased from the 134 ft. of the ML 100 Britannia to 122 ft., 2 ft. shorter

than the ML 300 Britannia.

With power engines chosen for maximum economy, the CL-28 will have an endurance of 24 hr. and a crew of 15. Maximum altitudes might be slightly less than the 17,000 ft. of the ML 300 Britannia.

Titanium is being used for the first time in a Canadian aerospace. The new parts require. It replaces stainless steel in the engine firewalls. The 640,000 lb. of titanium per aircraft replaces 1,400 2,700 lb. of stainless steel.

All wing and tail surface structural drawings have been released to American standards and North American equivalents established for all materials

and parts. With this exception, the wing and tail surfaces leading edge and the vertical fin leading surface, the main flight control system of the turbine are unchanged in the CL-28.

The original RCAP order for 11 aircraft has been increased, but the new order has not been disclosed.

British, which has its own Canadian subsidiaries will produce Britannia engines of the new Britannia purchased or on option by Canadian Pacific Air Lines at the plant of British Aerospace (Weymouth) Ltd. The Vancouver plant, being expanded, will have General's legal technology but will design for engines up to 5,000 hp.

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## F-101 Intake, Seals Designed for Supersonic Flight



**MAIN GEAR** of McDonnell F-101 reflects Nord design engine, worth in position of fuel on one face of leg where such handles would not up these off. But F101's landing speed can up the track, the delta wing off base on the one of the leg. Lanes are now being selected to the foot.



**TWIN TURBOJETS** of the Nord engine below the tail wing pylon structure. Taking between engine and under forward part of base is titanium structure to take the heat. Most and concrete effects of the tailpipe and constant strength. Note large track of the high mounted rib test.



**NOSE GEAR** of Nord engine below the tail wing pylon structure. Taking between engine and under forward part of base is titanium structure to take the heat. Most and concrete effects of the tailpipe and constant strength. Note large track of the high mounted rib test.



**SHARP LIPS** are characteristic of delta for supersonic flight. F-101's delta wings are triangular, with internal bracing some and boundary layer separator. The aircraft was joined F-101 W 317.

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## MATS Boeing YC-97J Operations Demonstrate High Performance of Propeller Type now in Production for Giant Douglas C-133A Transports

A USAF Boeing YC-97J turboprop aircraft, in operation with the 1700th Air Transport Group of the Military Air Transport Service (MATS), has set new records over both the Atlantic and Pacific Oceans—on tests that proved the precision control, smooth operation and long haul dependability of Curtiss-Wright Turboelectric propellers. In similar testing, the same MATS squadron kept two YC-97Js flying for a total of 46 hours, 35 minutes in a 24-hour period.

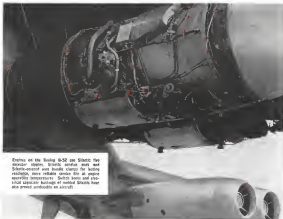
The high performance of Turboelectrics — the propellers specified for the giant USAF Douglas C-133A turboprop transports and for the major U.S. turboprop organs — is a result of precision control of engine speed and fuel mixture through positive pitch change and close synchronization.

Turboelectrics have been proven by 37,000 hours of test and flight on high-speed, long range turboprop aircraft — performance which is in turn backed by millions of hours on such aircraft as the B-36, using Curtiss Electro-Mechanical Propellers which embody many of the same design principles.

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## Certificates of Necessity

Douglas Aircraft Co. of El Segundo, Calif., has been awarded a \$8,170,000 certificate of necessity for accelerated test expenditures by the Office of Defense Mobilization. The certificate is for a reactivated development facility, and 80% of the total amount is allowed at the rapid rate.

Other certificates for the period Nov. 31 to June 30 are:

**Boeing Aviation Corp.**, Everett, Wash., for the production of military aircraft and development in military aircrafts. 80 million certified with 10% allowed. **Boeing Aircraft Co.**, Cedar City, Utah, military aircraft equipment. 3000 80% certified with 10% allowed.

**Edison Electric Power Corp.**, St. Louis, Mo., for the production of military aircrafts. 8000 80% certified with 10% allowed. **Edison Electric Power Corp.**, St. Louis, Mo., for the production of military aircrafts. 8000 80% certified with 10% allowed.

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## Lockheed Missile Plant

Architects drawing of Lockheed Missile System Division's new Burbank, Calif., plant. Facility will consist of 250,000 sq. ft. Original plan was to build a 90,000 sq. ft. warehouse-type building (upper right), but the project was canceled to make a smaller building for engineering (right front), administration building (left front) and exterior (upper left). Plans are for the plant to be completed by next summer.

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## Boeing Splits Shares, Adds Stock Dividend

Seattle-Two-for-one stock split approved last week by Boeing Aerospace Co. dividend is matched with a change in dividend policy. The policy is designed to permit a greater accumulation of capital funds needed, among other things, to finance an expansion program

in which it is estimated \$50 million will be spent by Dec. 31, 1955. Previous estimates had been around \$70 million.

Boeing stock, picked up almost 50 points on the New York Stock Exchange the morning the split was announced, but buyers were not so patient in the days it had been proposed by the board.

The stock closed at 94 1/2 at the end of the week the split was announced, as were as of 41 points.

President William M. Allen, in announcing the board action, said that the company requires substantial additional funds resulting from changes in government contract program, particularly in the development of new, major production program, as well as for additional plant and equipment.

Boeing previously had announced the expansion program for the Seattle unit. Included are a new development center, new major construction south of the main Seattle plant and additions to the engineering, office and manufacturing facilities at Renton, Wash.

Under the new policy, Boeing will pay a quarterly cash dividend of 25 cents per share, supplemented by a small annual stock dividend.

"It is expected," Allen said, "that the cash dividend at the new rate plus the cash value of the stock dividend will exceed the amount of the cash dividend at the rate in effect for 1954 as adjusted for the stock split."

In the opinion of the directors, the split, with the new stock, to be issued August 6, will broaden the market for the stock and result in an increase in stockholders.

# New SPS Fasteners Have 220,000 Psi Tensile Strength, Up to 90% Increase in Fatigue Strength\*



**EWB-22 Bolt is Safety Star.** External wrenching head with tapered bearing area permits great preloading without distortion of bolted surface. New thread form, precision ESW under head, smooth external surface increases tensile strength and fatigue resistance.



**P1-23 Precision Locking Washers** are used with EWB-22 to induce stress pattern in the bolt. They provide the most accurate known method for producing bolts during production assembly processes. They are sandblasted between stress tolerance hardened and washers.

Hi Psi units... results of advanced concepts in thread design and preloading techniques... add strength, security and weight saving to aircraft structures

Conventional bolts were not strong enough to fasten private aircraft new on driving benefits. So Standard Precision Steel Co. discarded obsolete thread forms, materials and production techniques and designed a new high strength bolt—the Hi Psi EWB-22—which has greater tensile and fatigue strength than ever before possible.

But it is impossible to get the full benefit of the strength of any bolt unless it is preloaded accurately. PSI washers, simple mechanical devices for preloading, assure that every Hi Psi bolt installed in an aircraft will carry its full share of the load.

Conventional nuts were not strong enough to develop the full strength of the EWB-22. So SPS produced the EWB-22 locknut to complement the bolt. It is a high tensile strength self-locking nut with a 12-point external wrenching surface which makes possible the high wrenching torque necessary to test the EWB-22 correctly.

\* Compared with standard 302 SS pin bolts at 5,000,000 cycles



**EWB-22 Locknut** was designed to develop the full strength of the EWB-22 bolt. One-piece all-metal nut has accurate bearing surface is correctly heat-treated for maximum tensile strength. Its 12-point external wrenching surface for high wrenching torque.

# New Hi-R Thread Form is Key to Great Fatigue Resistance



**EWB-22 Bolt Stressed to Destruction** in SPS fatigue testing laboratory. Thread fracture occurred at vicinity of end bearing flange.

The EWB-22 has 18% greater tensile strength and up to 50% greater fatigue strength than its strongest standard counterpart, the MS bolt. The high strength of the bolt is due partly to the new alloy steel of which it is manufactured, partly to the generous fillet under the head, and partly to the fact that the threads are cold rolled after the blank has been heat treated and ground smooth to remove all surface imperfections and decarburized metal.

But the chief factor in the great fatigue resistance of the EWB-22 is the new Hi-R thread form developed at SPS. Naturally, the diameter—and hence width—part of a bolt is the minor diameter of its threaded

section. The Hi-R thread form minimizes this diameter by 1.5 to 1.2% (depending upon bolt size). In addition, the thread root radius has been increased. This root radius is not a "wear tool arc," but a smooth uniform curve which flows smoothly to the thread flanks, at the point of 17% thread depth, with an uninterrupted surface. (Dressing paper, designed for 85% thread engagement, must be opened to accommodate the EWB-22. However, the thread will assemble readily with standard nuts, since the basis of the thread design is the 60° American National Thread profile.) The uniform radius reduces stress concentration factors, increasing fatigue resistance to a maximum.

**Ultimate Tensile Strength Curves** Chart shows actual strength at periods plotted against bolt diameter. Great strength in EWB-22 stems from SPS material selection, forming, self heat treating techniques.

## Mechanical Properties

	1/4-20	5/16-18	3/8-16	1/2-13	5/8-11	3/4-10	1-8	1 1/8-7	1 1/2-6	1 3/4-5	2-4 1/2	2 1/4-4	2 3/4-3 1/2	3-3	3 1/2-2 1/2	4-2	4 1/2-1 1/2	5-1 1/2	5 1/2-1 1/2	6-1 1/2	6 1/2-1 1/2	7-1 1/2	7 1/2-1 1/2	8-1 1/2	8 1/2-1 1/2	9-1 1/2	9 1/2-1 1/2	10-1 1/2	10 1/2-1 1/2	11-1 1/2	11 1/2-1 1/2	12-1 1/2	12 1/2-1 1/2	13-1 1/2	13 1/2-1 1/2	14-1 1/2	14 1/2-1 1/2	15-1 1/2	15 1/2-1 1/2	16-1 1/2	16 1/2-1 1/2	17-1 1/2	17 1/2-1 1/2	18-1 1/2	18 1/2-1 1/2	19-1 1/2	19 1/2-1 1/2	20-1 1/2	20 1/2-1 1/2	21-1 1/2	21 1/2-1 1/2	22-1 1/2	22 1/2-1 1/2	23-1 1/2	23 1/2-1 1/2	24-1 1/2	24 1/2-1 1/2	25-1 1/2	25 1/2-1 1/2	26-1 1/2	26 1/2-1 1/2	27-1 1/2	27 1/2-1 1/2	28-1 1/2	28 1/2-1 1/2	29-1 1/2	29 1/2-1 1/2	30-1 1/2	30 1/2-1 1/2	31-1 1/2	31 1/2-1 1/2	32-1 1/2	32 1/2-1 1/2	33-1 1/2	33 1/2-1 1/2	34-1 1/2	34 1/2-1 1/2	35-1 1/2	35 1/2-1 1/2	36-1 1/2	36 1/2-1 1/2	37-1 1/2	37 1/2-1 1/2	38-1 1/2	38 1/2-1 1/2	39-1 1/2	39 1/2-1 1/2	40-1 1/2	40 1/2-1 1/2	41-1 1/2	41 1/2-1 1/2	42-1 1/2	42 1/2-1 1/2	43-1 1/2	43 1/2-1 1/2	44-1 1/2	44 1/2-1 1/2	45-1 1/2	45 1/2-1 1/2	46-1 1/2	46 1/2-1 1/2	47-1 1/2	47 1/2-1 1/2	48-1 1/2	48 1/2-1 1/2	49-1 1/2	49 1/2-1 1/2	50-1 1/2	50 1/2-1 1/2	51-1 1/2	51 1/2-1 1/2	52-1 1/2	52 1/2-1 1/2	53-1 1/2	53 1/2-1 1/2	54-1 1/2	54 1/2-1 1/2	55-1 1/2	55 1/2-1 1/2	56-1 1/2	56 1/2-1 1/2	57-1 1/2	57 1/2-1 1/2	58-1 1/2	58 1/2-1 1/2	59-1 1/2	59 1/2-1 1/2	60-1 1/2	60 1/2-1 1/2	61-1 1/2	61 1/2-1 1/2	62-1 1/2	62 1/2-1 1/2	63-1 1/2	63 1/2-1 1/2	64-1 1/2	64 1/2-1 1/2	65-1 1/2	65 1/2-1 1/2	66-1 1/2	66 1/2-1 1/2	67-1 1/2	67 1/2-1 1/2	68-1 1/2	68 1/2-1 1/2	69-1 1/2	69 1/2-1 1/2	70-1 1/2	70 1/2-1 1/2	71-1 1/2	71 1/2-1 1/2	72-1 1/2	72 1/2-1 1/2	73-1 1/2	73 1/2-1 1/2	74-1 1/2	74 1/2-1 1/2	75-1 1/2	75 1/2-1 1/2	76-1 1/2	76 1/2-1 1/2	77-1 1/2	77 1/2-1 1/2	78-1 1/2	78 1/2-1 1/2	79-1 1/2	79 1/2-1 1/2	80-1 1/2	80 1/2-1 1/2	81-1 1/2	81 1/2-1 1/2	82-1 1/2	82 1/2-1 1/2	83-1 1/2	83 1/2-1 1/2	84-1 1/2	84 1/2-1 1/2	85-1 1/2	85 1/2-1 1/2	86-1 1/2	86 1/2-1 1/2	87-1 1/2	87 1/2-1 1/2	88-1 1/2	88 1/2-1 1/2	89-1 1/2	89 1/2-1 1/2	90-1 1/2	90 1/2-1 1/2	91-1 1/2	91 1/2-1 1/2	92-1 1/2	92 1/2-1 1/2	93-1 1/2	93 1/2-1 1/2	94-1 1/2	94 1/2-1 1/2	95-1 1/2	95 1/2-1 1/2	96-1 1/2	96 1/2-1 1/2	97-1 1/2	97 1/2-1 1/2	98-1 1/2	98 1/2-1 1/2	99-1 1/2	99 1/2-1 1/2	100-1 1/2	100 1/2-1 1/2	101-1 1/2	101 1/2-1 1/2	102-1 1/2	102 1/2-1 1/2	103-1 1/2	103 1/2-1 1/2	104-1 1/2	104 1/2-1 1/2	105-1 1/2	105 1/2-1 1/2	106-1 1/2	106 1/2-1 1/2	107-1 1/2	107 1/2-1 1/2	108-1 1/2	108 1/2-1 1/2	109-1 1/2	109 1/2-1 1/2	110-1 1/2	110 1/2-1 1/2	111-1 1/2	111 1/2-1 1/2	112-1 1/2	112 1/2-1 1/2	113-1 1/2	113 1/2-1 1/2	114-1 1/2	114 1/2-1 1/2	115-1 1/2	115 1/2-1 1/2	116-1 1/2	116 1/2-1 1/2	117-1 1/2	117 1/2-1 1/2	118-1 1/2	118 1/2-1 1/2	119-1 1/2	119 1/2-1 1/2	120-1 1/2	120 1/2-1 1/2	121-1 1/2	121 1/2-1 1/2	122-1 1/2	122 1/2-1 1/2	123-1 1/2	123 1/2-1 1/2	124-1 1/2	124 1/2-1 1/2	125-1 1/2	125 1/2-1 1/2	126-1 1/2	126 1/2-1 1/2	127-1 1/2	127 1/2-1 1/2	128-1 1/2	128 1/2-1 1/2	129-1 1/2	129 1/2-1 1/2	130-1 1/2	130 1/2-1 1/2	131-1 1/2	131 1/2-1 1/2	132-1 1/2	132 1/2-1 1/2	133-1 1/2	133 1/2-1 1/2	134-1 1/2	134 1/2-1 1/2	135-1 1/2	135 1/2-1 1/2	136-1 1/2	136 1/2-1 1/2	137-1 1/2	137 1/2-1 1/2	138-1 1/2	138 1/2-1 1/2	139-1 1/2	139 1/2-1 1/2	140-1 1/2	140 1/2-1 1/2	141-1 1/2	141 1/2-1 1/2	142-1 1/2	142 1/2-1 1/2	143-1 1/2	143 1/2-1 1/2	144-1 1/2	144 1/2-1 1/2	145-1 1/2	145 1/2-1 1/2	146-1 1/2	146 1/2-1 1/2	147-1 1/2	147 1/2-1 1/2	148-1 1/2	148 1/2-1 1/2	149-1 1/2	149 1/2-1 1/2	150-1 1/2	150 1/2-1 1/2	151-1 1/2	151 1/2-1 1/2	152-1 1/2	152 1/2-1 1/2	153-1 1/2	153 1/2-1 1/2	154-1 1/2	154 1/2-1 1/2	155-1 1/2	155 1/2-1 1/2	156-1 1/2	156 1/2-1 1/2	157-1 1/2	157 1/2-1 1/2	158-1 1/2	158 1/2-1 1/2	159-1 1/2	159 1/2-1 1/2	160-1 1/2	160 1/2-1 1/2	161-1 1/2	161 1/2-1 1/2	162-1 1/2	162 1/2-1 1/2	163-1 1/2	163 1/2-1 1/2	164-1 1/2	164 1/2-1 1/2	165-1 1/2	165 1/2-1 1/2	166-1 1/2	166 1/2-1 1/2	167-1 1/2	167 1/2-1 1/2	168-1 1/2	168 1/2-1 1/2	169-1 1/2	169 1/2-1 1/2	170-1 1/2	170 1/2-1 1/2	171-1 1/2	171 1/2-1 1/2	172-1 1/2	172 1/2-1 1/2	173-1 1/2	173 1/2-1 1/2	174-1 1/2	174 1/2-1 1/2	175-1 1/2	175 1/2-1 1/2	176-1 1/2	176 1/2-1 1/2	177-1 1/2	177 1/2-1 1/2	178-1 1/2	178 1/2-1 1/2	179-1 1/2	179 1/2-1 1/2	180-1 1/2	180 1/2-1 1/2	181-1 1/2	181 1/2-1 1/2	182-1 1/2	182 1/2-1 1/2	183-1 1/2	183 1/2-1 1/2	184-1 1/2	184 1/2-1 1/2	185-1 1/2	185 1/2-1 1/2	186-1 1/2	186 1/2-1 1/2	187-1 1/2	187 1/2-1 1/2	188-1 1/2	188 1/2-1 1/2	189-1 1/2	189 1/2-1 1/2	190-1 1/2	190 1/2-1 1/2	191-1 1/2	191 1/2-1 1/2	192-1 1/2	192 1/2-1 1/2	193-1 1/2	193 1/2-1 1/2	194-1 1/2	194 1/2-1 1/2	195-1 1/2	195 1/2-1 1/2	196-1 1/2	196 1/2-1 1/2	197-1 1/2	197 1/2-1 1/2	198-1 1/2	198 1/2-1 1/2	199-1 1/2	199 1/2-1 1/2	200-1 1/2	200 1/2-1 1/2	201-1 1/2	201 1/2-1 1/2	202-1 1/2	202 1/2-1 1/2	203-1 1/2	203 1/2-1 1/2	204-1 1/2	204 1/2-1 1/2	205-1 1/2	205 1/2-1 1/2	206-1 1/2	206 1/2-1 1/2	207-1 1/2	207 1/2-1 1/2	208-1 1/2	208 1/2-1 1/2	209-1 1/2	209 1/2-1 1/2	210-1 1/2	210 1/2-1 1/2	211-1 1/2	211 1/2-1 1/2	212-1 1/2	212 1/2-1 1/2	213-1 1/2	213 1/2-1 1/2	214-1 1/2	214 1/2-1 1/2	215-1 1/2	215 1/2-1 1/2	216-1 1/2	216 1/2-1 1/2	217-1 1/2	217 1/2-1 1/2	218-1 1/2	218 1/2-1 1/2	219-1 1/2	219 1/2-1 1/2	220-1 1/2	220 1/2-1 1/2	221-1 1/2	221 1/2-1 1/2	222-1 1/2	222 1/2-1 1/2	223-1 1/2	223 1/2-1 1/2	224-1 1/2	224 1/2-1 1/2	225-1 1/2	225 1/2-1 1/2	226-1 1/2	226 1/2-1 1/2	227-1 1/2	227 1/2-1 1/2	228-1 1/2	228 1/2-1 1/2	229-1 1/2	229 1/2-1 1/2	230-1 1/2	230 1/2-1 1/2	231-1 1/2	231 1/2-1 1/2	232-1 1/2	232 1/2-1 1/2	233-1 1/2	233 1/2-1 1/2	234-1 1/2	234 1/2-1 1/2	235-1 1/2	235 1/2-1 1/2	236-1 1/2	236 1/2-1 1/2	237-1 1/2	237 1/2-1 1/2	238-1 1/2	238 1/2-1 1/2	239-1 1/2	239 1/2-1 1/2	240-1 1/2	240 1/2-1 1/2	241-1 1/2	241 1/2-1 1/2	242-1 1/2	242 1/2-1 1/2	243-1 1/2	243 1/2-1 1/2	244-1 1/2	244 1/2-1 1/2	245-1 1/2	245 1/2-1 1/2	246-1 1/2	246 1/2-1 1/2	247-1 1/2	247 1/2-1 1/2	248-1 1/2	248 1/2-1 1/2	249-1 1/2	249 1/2-1 1/2	250-1 1/2	250 1/2-1 1/2	251-1 1/2	251 1/2-1 1/2	252-1 1/2	252 1/2-1 1/2	253-1 1/2	253 1/2-1 1/2	254-1 1/2	254 1/2-1 1/2	255-1 1/2	255 1/2-1 1/2	256-1 1/2	256 1/2-1 1/2	257-1 1/2	257 1/2-1 1/2	258-1 1/2	258 1/2-1 1/2	259-1 1/2	259 1/2-1 1/2	260-1 1/2	260 1/2-1 1/2	261-1 1/2	261 1/2-1 1/2	262-1 1/2	262 1/2-1 1/2	263-1 1/2	263 1/2-1 1/2	264-1 1/2	264 1/2-1 1/2	265-1 1/2	265 1/2-1 1/2	266-1 1/2	266 1/2-1 1/2	267-1 1/2	267 1/2-1 1/2	268-1 1/2	268 1/2-1 1/2	269-1 1/2	269 1/2-1 1/2	270-1 1/2	270 1/2-1 1/2	271-1 1/2	271 1/2-1 1/2	272-1 1/2	272 1/2-1 1/2	273-1 1/2	273 1/2-1 1/2	274-1 1/2	274 1/2-1 1/2	275-1 1/2	275 1/2-1 1/2	276-1 1/2	276 1/2-1 1/2	277-1 1/2	277 1/2-1 1/2	278-1 1/2	278 1/2-1 1/2	279-1 1/2	279 1/2-1 1/2	280-1 1/2	280 1/2-1 1/2	281-1 1/2	281 1/2-1 1/2	282-1 1/2	282 1/2-1 1/2	283-1 1/2	283 1/2-1 1/2	284-1 1/2	284 1/2-1 1/2	285-1 1/2	285 1/2-1 1/2	286-1 1/2	286 1/2-1 1/2	287-1 1/2	287 1/2-1 1/2	288-1 1/2	288 1/2-1 1/2	289-1 1/2	289 1/2-1 1/2	290-1 1/2	290 1/2-1 1/2	291-1 1/2	291 1/2-1 1/2	292-1 1/2	292 1/2-1 1/2	293-1 1/2	293 1/2-1 1/2	294-1 1/2	294 1/2-1 1/2	295-1 1/2	295 1/2-1 1/2	296-1 1/2	296 1/2-1 1/2	297-1 1/2	297 1/2-1 1/2	298-1 1/2	298 1/2-1 1/2	299-1 1/2	299 1/2-1 1/2	300-1 1/2	300 1/2-1 1/2	301-1 1/2	301 1/2-1 1/2	302-1 1/2	302 1/2-1 1/2	303-1 1/2	303 1/2-1 1/2	304-1 1/2	304 1/2-1 1/2	305-1 1/2	305 1/2-1 1/2	306-1 1/2	306 1/2-1 1/2	307-1 1/2	307 1/2-1 1/2	308-1 1/2	308 1/2-1 1/2	309-1 1/2	309 1/2-1 1/2	310-1 1/2	310 1/2-1 1/2	311-1 1/2	311 1/2-1 1/2	312-1 1/2	312 1/2-1 1/2	313-1 1/2	313 1/2-1 1/2	314-1 1/2	314 1/2-1 1/2	315-1 1/2	315 1/2-1 1/2	316-1 1/2	316 1/2-1 1/2	317-1 1/2	317 1/2-1 1/2	318-1 1/2	318 1/2-1 1/2	319-1 1/2	319 1/2-1 1/2	320-1 1/2	320 1/2-1 1/2	321-1 1/2	321 1/2-1 1/2	322-1 1/2	322 1/2-1 1/2	323-1 1/2	323 1/2-1 1/2	324-1 1/2	324 1/2-1 1/2	325-1 1/2	325 1/2-1 1/2	326-1 1/2	326 1/2-1 1/2	327-1 1/2	327 1/2-1 1/2	328-1 1/2	328 1/2-1 1/2	329-1 1/2	329 1/2-1 1/2	330-1 1/2	330 1/2-1 1/2	331-1 1/2	331 1/2-1 1/2	332-1 1/2	332 1/2-1 1/2	333-1 1/2	333 1/2-1 1/2	334-1 1/2	334 1/2-1 1/2	335-1 1/2	335 1/2-1 1/2	336-1 1/2	336 1/2-1 1/2	337-1 1/2	337 1/2-1 1/2	338-1 1/2	338 1/2-1 1/2	339-1 1/2	339 1/2-1 1/2	340-1 1/2	340 1/2-1 1/2	341-1 1/2	341 1/2-1 1/2	342-1 1/2	342 1/2-1 1/2	343-1 1/2	343 1/2-1 1/2	344-1 1/2	344 1/2-1 1/2	345-1 1/2	345 1/2-1 1/2	346-1 1/2	346 1/2-1 1/2	347-1 1/2	347 1/2-1 1/2	348-1 1/2	348 1/2-1 1/2	349-1 1/2	349 1/2-1 1/2	350-1 1/2	350 1/2-1 1/2	351-1 1/2	351 1/2-1 1/2	352-1 1/2	352 1/2-1 1/2	353-1 1/2	353 1/2-1 1/2	354-1 1/2	354 1/2-1 1/2	355-1 1/2	355 1/2-1 1/2	356-1 1/2	356 1/2-1 1/2	357-1 1/2	357 1/2-1 1/2	358-1 1/2	358 1/2-1 1/2	359-1 1/2	359 1/2-1 1/2	360-1 1/2	360 1/2-1 1/2	361-1 1/2	361 1/2-1 1/2	362-1 1/2	362 1/2-1 1/2	363-1 1/2	363 1/2-1 1/2	364-1 1/2	364 1/2-1 1/2	365-1 1/2	365 1/2-1 1/2	366-1 1/2	366 1/2-1 1/2	367-1 1/2	367 1/2-1 1/2	368-1 1/2	368 1/2-1 1/2	369-1 1/2	369 1/2-1 1/2	370-1 1/2	370 1/2-1 1/2	371-1 1/2	371 1/2-1 1/2	372-1 1/2	372 1/2-1 1/2	373-1 1/2	373 1/2-1 1/2	374-1 1/2	374 1/2-1 1/2	375-1 1/2	375 1/2-1 1/2	376-1 1/2	376 1/2-1 1/2	377-1 1/2	377 1/2-1 1/2	378-1 1/2	378 1/2-1 1/2	379-1 1/2	379 1/2-1 1/2	380-1 1/2	380 1/2-1 1/2	381-1 1/2	381 1/2-1 1/2	382-1 1/2	382 1/2-1 1/2	383-1 1/2	383 1/2-1 1/2	384-1 1/2	384 1/2-1 1/2	385-1 1/2	385 1/2-1 1/2	386-1 1/2	386 1/2-1 1/2	387-1 1/2	387 1/2-1 1/2	388-1 1/2	388 1/2-1 1/2	389-1 1/2	389 1/2-1 1/2	390-1 1/2	390 1/2-1 1/2	391-1 1/2	391 1/2-1
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**New EWN-22 Nut ...  
Preloaded with PLI Washers ...  
Develops Full Strength of Bolt**

The EWN-22 self-locking nut equals the EWN-22 bolt in fatigue strength. The load is distributed over more metal threads than in conventional fasteners. And increased dimensions—in thickness of base and washer face, and area of bearing surface—help reduce stress concentrations in a new way.

Assembling 3/4" Dia-22 fasteners is a simple operation. The nut is tightened down until the outer PLI ring can no longer be rotated by a wire inserted in a filler hole. No complex electronic equipment, no wearable range wrench readings. Only strain gage or extensometer measurements—can be feasible in production operations—assured PLI washers in accuracy.

Detailed information on 3/4" Dia fasteners will be gladly sent on request. Write Aircraft Products Division, Standard Pressed Steel Co., Jenkintown 3, Pa.



**Strain Gage Measurements**, electronically recorded, show that preloading with PLI washers is accurate within  $\pm 1\%$ . Preloading by torque wrench readings varies as much as 30%.



**Before Preloading:** Inner PLI ring has not been compressed. Outer PLI ring can be rotated freely by wire in filler hole. Nut is then tightened until outer ring cannot be rotated.



**After Preloading:** Nut has been tightened down fully. Inner PLI ring has been plasticly deformed by compression. Preload on bolt equals force required to deform outer ring.

STANDARD PRESSED STEEL CO.

**SPS**

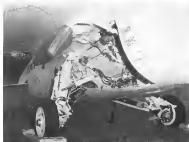
JENKINTOWN PENNSYLVANIA

AIRCRAFT PRODUCTS DIVISION



## Tiger Tail Lengthened

Tail pipe of the Grumman F-11F-1 has been extended on the latest models (above). Aircraft normally does not rest on tail skid. Here main wheels are resting on ground lower than fuselage on which front wheel is parked, and bringing tail skid onto ground. Folded lower (right and below) portion wheel will draw from fuselage during ground handling. Perfect clearance not necessary to prevent chattering of surface on the upper wing. Navy fighter. Skid is attached to fuselage under horizontal stabilizer in the "overboard fuel vent boom." Forward fueling receptacle is located in wheel well. Skid number also Navy serial number on fuselage is modified designation noting in comparison of improvements. Number is now being changed to a Navy lettering system.



AVIATION WEEK, July 16, 1956

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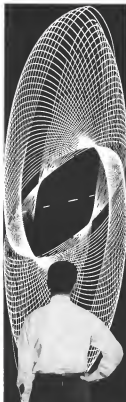
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## **Navy Contracts**

Following is a list of published contracts of \$25,000 and over as released by Navy Contracting Office:

#### BUREAU OF AERONAUTICS, Washington

**W. B. C.**  
The Stevens Electric Mfg. Co., 608 Sherman Ave., St. Louis 17, Mo., major location also 1000 E. New 100th St., St. Louis 17, Mo. (314) 431-1111; 431-1111.

Weather change group, 114 S. Kalamazoo Ave., Chicago 24, Ill. (312) 431-1111; 431-1111.

Weather change group, 114 S. Kalamazoo Ave., Chicago 24, Ill. (312) 431-1111; 431-1111.

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Weather change group, 114 S. Kalamazoo Ave., Chicago 24, Ill. (312) 431-1111; 431-1111.

partial stoppage for mod. line 1000 E. New 100th St., St. Louis 17, Mo. (314) 431-1111; 431-1111.

NAVAL AIR MATERIAL CENTER, Naval Base, Philadelphia 31, Pa. April 10, 1964. (214) 431-1111; 431-1111.

NAVAL AIR MATERIAL CENTER, Naval Base, Philadelphia 31, Pa. April 10, 1964. (214) 431-1111; 431-1111.

NAVAL AIR MATERIAL CENTER, Naval Base, Philadelphia 31, Pa. April 10, 1964. (214) 431-1111; 431-1111.

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## Aircraft Controls

chosen by Northrop for remote control of tow target reel

The new Nordrop tow target reel, mounted in the rear cockpit of an F-89 interceptor, is capable of pulling gear target at speeds exceeding 600 miles an hour. By means of the Barber-Colman apparatus illustrated below, the pilot maintains high response, finger tip control of reel speed.



The Northrop tow target reel, shown above, is driven by an air turbine. A Barber-Colman 5" supply air turbine valve is positioned at a speed of 90 degrees per second, without hunting, by the Barber-Colman patented high speed, velocity feedback 28 volt d.c. servo. Send for free technical literature.

The complete line of Barber-Colman remote controls includes Actuators, Positioning Controls, Temperature Controls, Small Motors, Valves, Ultra Sensitive Relays, Thermal Sensitive Elements. Consult the Barber-Colman engineering sales office nearest you: Los Angeles, Seattle, Baltimore, New York, Montreal, Melbourne.

**Barber-Colman Company**

DEPT. A-1422 ROCK STREET ROCKFORD, ILLINOIS

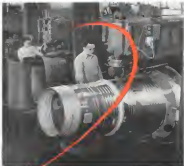
model 1000, various sizes and models available. 120  
Aircraft Controls, Inc., 1000 W. 10th St., 1st Fl.,  
Ft. Worth, Tex. 76102. Tel. 741-1111. Cable: Barber-Colman  
Rockford, Ill. 61101. 1000 W. 10th St., 1st Fl.,  
Rockford, Ill. 61101. 1000 W. 10th St., 1st Fl.,  
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Ft. Worth, Tex. 76102. Tel. 741-1111. Cable: Barber-Colman  
Rockford, Ill. 61101. 1000 W. 10th St., 1st Fl.,  
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### Radar Tape Recorder

Access (top) of 4000 lighter helicopter  
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times of airborne tape recorder which plots  
back operation of airplane for control  
system during attack. Called NADAR,  
recorder is a product of North American  
Aviation's Avionics Division. It trans-  
mits information taken from plane's radar  
equipment into digital operating position  
of plane and target. After completion of  
a mission, pilot of 4000 (below) obtains  
feedback during training from Air Force  
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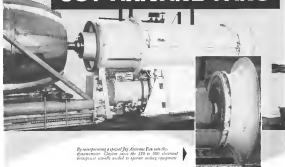
This illustrated brochure gives additional data on Lavelle services. Write for a copy without obligation.

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# New PROPELLERLESS Aircraft Engine Tester Uses JOY AXIVANE FANS



By incorporating a special Joy Axivane Fan aerodynamic dynamometer, Clayton tests the 250 to 600 electrical horsepower usually required to operate auxiliary fans to cool the engine.

Clayton Manufacturing Company, El Monte, California, utilizes a Joy Axivane Fan in their remarkable new aircraft engine dynamometer. The virtually noiseless testing device dispenses with the usual club propeller. Instead, the propeller shaft is attached to a "turbine absorber" which absorbs engine torque and measures performance.

An important integral part of the mechanism is the Joy Axivane Fan, which forecasts the air blast to cool the engine.

This fan is directly driven by the engine being tested. It eliminates the need for the 250 to 600 electrical horsepower usually required to operate auxiliary fans to cool the engine.

The Clayton Dynamometer was developed for TWA. Four will be installed in test cells in addition to the one illustrated above. In addition, each of the new test cells will be equipped with two soundproof, roof-installed Joy Axivane Fans. Joy Manufacturing Company, 6511er Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.

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## Temco Jet Trainer

Model 11 primary jet trainer built by Temco Aircraft Corp. of Dallas was accepted by Navy after tests at Patuxent River, Md. Delivery in "evaluation quantity" is scheduled to start July 1957. Airplane is powered by Continental TYP 340 rated at 520 BHP. Trainer has engine with liquid engine equipment, speed brake. With maximum speed of about 500 knots, power on land at 62 knots, take off over a 50 ft. altitude in 3,000 ft. Model 11 has 12 instruments on one bank and service ceiling of 18,000 ft.



## USAF Contracts

A following is a list of unclassified contracts for \$1,000,000 and over as released by Air Force Contracting Office:

**ORDINANCE, CIVIL AIR MANUFACTURING**  
Navy, Quincy, Mass. - **General Dynamics Corp.**, Fort Worth, Texas, \$1,000,000. **General Dynamics Corp.**, Fort Worth, Texas, \$1,000,000. **General Dynamics Corp.**, Fort Worth, Texas, \$1,000,000. **General Dynamics Corp.**, Fort Worth, Texas, \$1,000,000.

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## The Interceptor champion has a midjet manager

The developers of Century Series Aircraft has greatly intensified the need for Giannini precision instruments and systems to simplify the increasing complexities of high speed, high altitude flight. An outstanding example is the Giannini functional Mach computer for the eleven trans-sonic systems which enables the Convair F-102A all-weather interceptor to maintain subsonic trim characteristics at supersonic speeds.

The trans-sonic system, a highly accurate Mach number and altitude sensing/computing system which reacts to speed changes as small as 0.0005 Mach, is one version of the forward looking network computing systems previously designed and developed by Giannini avionics engineers. The basic design

Giannini Trim-servo System specified for Convair F-102A... wide range...high altitude...sensitive

has such capability and flexibility that a prototype computing system was produced in less than three weeks. Delivery of the first production model was made in less than two weeks from date of purchase order.

This rapid design and development is one more instance of Giannini's superior performance in the engineering and production of quality avionics equipment.



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RELAY OPERATORS (left) who transmit Voice data relay information may soon be replaced by automatic voice relay. Voice recordings of key word-groups stored on magnetic drums (above), are automatically joined together according to Voice data which are then transmitted over "CHITCHAT" radio channels.

## Priorities Built In Automatic Voice Relay

By Philip J. Klein

An automatic voice relay (AVR) which converts Voice (human-to-human) flight path steering signals into binary voice radio commands, giving priority to urgent messages, has been developed by Clark Research Laboratories, Skokie, Ill., under USAF sponsorship.

A key sophisticated version of the automatic voice relay could eliminate language difficulties for international pilots by enabling them to use traffic controllers to give instructions in a variety of languages.

A keyboard identified in the controller's active language.

Voice computer flight path steering instructions presently are displayed on displays to first human relay operator who must convert what they see into voice radio instructions to each airplane under control. Each relay operator manually handles these aircraft shows a bank with an operating on-center track and permitting, i.e., in which aircraft are in and out of prospect guidance instructions.

The Clark automatic voice relay equipment will make it possible to place the first human relay operator with a single relay operator. The latter will be available to handle emergencies or messages which might be outside the AVR's limited vocabulary. The relay operator will sit in a control console from which he can monitor all outgoing transmissions and receive incoming messages from aircraft.

### Evaluated this Fall

The AVR was developed for Air Force, Cambridge Research Center's Navigation Laboratory and will be evaluated with a new prototype Voice relay unit this fall. Navigation Laboratory Chief Ben Glickman reports that the Air Force Development Board has expressed an interest in a semi-automatic voice relay to evaluate its own capabilities.

Head of the AVR is a magnetic drum unit which can store binary voice recordings of 81 key word-groups. These are automatically selected and passed together to Voice relay operator who then transmits to each plane via radio channel.

In a semi-automatic version for multi-legal use, key word-groups would be recorded in several languages. A traffic controller would select the language in which he wished to transmit his instructions, then select the desired message in selected language on

### Message Priority

One of the most unusual features of the Clark AVR is its ability to give priority automatically to more urgent messages. The prototype has 15 channels, one more than the number of Voice channels. These 15 channels are divided into four groups of four each group having a single radio frequency channel. Thus, for example, a single frequency for Voice instructions.

Because individual Voice commands usually come up with new instructions to maintain the AVR, and because, and so on in order of priority for transmission of the five channels assigned to each frequency.

It does this both on the basis of message content (how large a change of heading is required), and how far out the airplane is in its approach. The system assigns the first approach rate in given highest priority. The AVR maintains a race leading to an aircraft only when Voice calls for a heading change of 5 deg or more.

Once selected, each of the four transmission channels, except the random Voice output signals, determines the highest priority signal, then assembles the required message from the recorded word-groups in the magnetic drum.

### AVR Vocabulary

To simplify the vocabularies of word-groups, which must be stored on the drum, individual aircraft entering the Voice control area will be assigned code identification as "Red Three" or "White Five." Automatic voice relay instructions will be addressed to them using the assigned code identification. The recording of word-groups is "two-handed word key" system, instead of according to individual words, "two" "handful," "two," etc., requires more drum capacity. However, it greatly increases the intelligibility of the AVR, because the phrasing is more natural than if the individual words were extracted and joined together, explained Tom Dendelink, AVR project engineer.

### Several Advantages

In addition to decreasing three of the four known relay operators now required for Voice, the new auto-



**HOW A TINY NEW TUBE HELPS SAVE LIVES**

The problem was major. It concerned human life. A pocket-sized waterproof "radio station" would help rescue downed aviators. The set was designed to send out a beacon signal and provide voice contact with rescue planes—but it lacked the necessary power output. Needed tubes did not exist.

Using its own resources, Raytheon developed a new subminiature tube—the 6147 and its improved version the 6297. Result: greater power, reliable operation, ranges over 50 miles, longer battery life.

Here is particularly dramatic proof of the skills which have made Raytheon the world's leading manufacturer of special purpose electron tubes

**RAYTHEON MANUFACTURING COMPANY**  
WALTHAM 54, MASSACHUSETTS

**RAYTHEON**  
Confidence in Electronics



radio voice tube has several other significant advantages. It will:

- Eliminate human errors in reading Volume indicators and controlling them with vocal instructions. The AVR doesn't tire.
- Provide streamlined storage structure.
- Require average intelligibility, by permitting use of a recorded voice with ideal pitch and precise enunciation.

The automatic voice tube is an outgrowth of a Cambridge Research Center development for a climatic aid project. Although the USAF expects eventually to equip its aircraft with automatic data link for transmission of Volume and air defense information, the AVR will provide a useful back-up for data link when that time comes. Meanwhile the AVR has several important military applications in addition to Volume, and it might, in subminiature version, prove a great boon to pilots and controllers at international airports around the world.

## Expansions, Changes In Avionics Industry

Sperry-Rand will build a new \$11 million 50,000 sq. ft. research and development facility in Salt Lake City, slated to begin operations before year end. Sperry's active interest moves into the Rocky Mountain area by Glen L. Martin and Ramo Wooldridge. The new Sperry Utah Engineering Laboratory will be headed by Paul W. Vostag, formerly in charge of Ground Armament Engineering at Sperry, Glenview, Ill. Company says it will employ 300 engineers and technicians at new facility. Company also has decided

to develop instrumentation Division to develop instrumentation. The new \$750,000 laboratory is located at South New York, Conn. and will be directed by manager and Dr. Bernard J. Rabinow, technical director.

Other recent expansions and changes in the avionics industry include:

- **The Ramo-Wooldridge Corp.,** Los Angeles, has established a research, development and technical liaison activity in Boston at 1316 Soldiers Field Road. Office is headed by George T. Jones, former chief engineer of Laboratory for Electronics.

- **American Bosch Arms Corp.,** Garden City, N. Y., will operate 750,000 sq. ft. Government-owned facility near Chicago's Melrose, airport, previously operated by Bend/Sylvania-Packard to build jet engine parts. Armco says plant will be used to support an expanding defense production program. Company holds contracts for B-52 component and Atlas missile guidance.

- **Raytheon Manufacturing Co.** will build new engineering laboratory for a series of infrared component tests. Santa Barbara, Calif. The 35,000 sq. ft. facility is expected to employ a total of 125. A small subunit group is now working to transport quarters to Santa Barbara.

- **Marconi Electronics Div.,** National Aircraft Corp., Burbank, Calif., has established an advanced electronic research center in San Diego, Calif., at 7665 Harbor Dr. New facility will work in fabricating data handling and display, guidance and navigation.

- **Eldec-McGough, Inc.,** San Diego, Calif., has opened a new electronic tube facility at Salt Lake City to develop and produce radar equipment for airborne applications.



## Rugged Camera

New ruggedized TV camera, Model ED-102, designed for use in shockproof use, has operated successfully despite 10G's applied in each of three runs. Unit can be operated up to 75,000 ft. altitude. Lens opening and focus can be adjusted by remote control. Camera weighs 6 lb.—measures 1 x 1 x 9 in., employs 324 line camera, 10 fields selected with 500 line resolution. Manufacturer: General Precision Laboratory, Princeton, N. J.

- **Consolidated Electronics Industries Corp.,** New York, has purchased Technical Electronics Corp., Corbin, Calif., maker of radars, systems and silicon and packaged electronic systems. New acquisition will immediately bring motion produced by transfer division of the parent company, A. W. Hudson Div.

- **National Electronics Corp.** is now run by Marconi Electronics Co. Los Angeles. Company also has purchased El Ray, Niles, Inc., North Hollywood, maker of fast-track long-range motion.



## Fibermold Quenches Fuel-Thirsty Planes for FLIGHT REFUELING, INC.

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Fibermold can be developed a product to work producing high-energy, low-pressure plasmas in various for the aviation industry. Our sales engineers are experts in all aspects of designing, developing and producing through various Fibermold of high-energy plasmas. We can meet your specific requirements.

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## Fibermold Division Manufacturers of High Energy Filamentary Plasma



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► **Come and Get It—New** high power airborne radar beacon for airborne beacons developed by Sperry Gyroscope Co. makes it possible for Lockheed USAF aircraft to spot the radar radar of nearby hostiles. Developed under Wright Air Development Center sponsorship, the new APN-69 beacon is being produced both by Sperry and Bendix Corp.

► **An Objective—Greater use of women in engineering and the physical sciences to ease the critical shortage in these fields has been urged by Dr. Charles H. Joffe, vice president and technical director of Radio Corp. of America. Noting that 20% of the engineers in Russia are women, compared to less than 1% in the U.S., Joffe calls for efforts to attract high school girls to science.**

► **Canadian Decca-Bendix Traffic** has obtained Canadian rights to manufacture and sell the Bendix-Decca military system. Canadian Air Force and seven specially qualified test units and the Canadian Hydrographic Office, has accepted it payments for and along the country's east coast.

► **ADF Spec Award—Aeronautical Radio Inc. has won a new airborne direction finder characteristic No. 550A, prepared by its Airlines Electronic Engineering Committee. Copies are available in restricted numbers from ARA's address, 1700 "K" St. N.W., Washington, D.C.**

► **New Transponder Source—Stearns Warner is entering the airborne transponder market with an air traffic control transponder designed to meet spec (No. 5123).**

► **Lowest U.S. Complex Weight—Scout 50, manufactured with Scout 50-F2 autopilot and especially rugged, have been authorized by the British Air Registration Board to make airborne U.S. approaches down to within 200 feet of the runway to take on turbulent conditions. Scout 50 has also break-off height limit in the lowest approved by an civil authority.**

► **NEC Date Set—National Electronics Conference will be held in Chicago Oct. 1-3. Theme: "Fifty Years of Progress Through Electronics." Conference is sponsored by American Institute of Electrical Engineers, Institute of Radio Engineers, Illinois Institute of Technology, Illinois and Northwestern Universities.**

## Cessna T-37 designed for Jet Training

To meet jet age demands, the U. S. Air Force requires a jet trainer that makes it easy for cadet-pilots to master first-line combat airplanes.

The Cessna-developed T-37 introduces the cadet to all combat jet airplane characteristics while training on this safe, easy-to-fly jet trainer.

It is designed to provide the Air Force with a jet trainer that can be operated at substantial savings and cover the most important and longest phase of the cadet-pilot's jet training.

It is a privilege for us here at Cessna to team with the Air Force in its forward-thinking plans for the jet age. CESSNA AIRCRAFT COMPANY, Wichita, Kans.



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## EQUIPMENT

### Rubber Bags in DC-3 Carry Bulk Oil

By Aljea Goshert

McBourne—New method of transporting bulk supplies of petroleum products by air was evolved in Australia to keep petroleum product prices at reasonable level in the outback areas of New Guinea.

Synthetic rubber bags of special design, replacing steel drums will be in each placard inside Douglas DC-3 belonging to Mandated Airlines Ltd. They will be usually used in supplying the isolated Goroka area in the central highlands of New Guinea. The operation will be the first commercial venture of its kind in the world. The idea was initiated by aviation officers and engineers of Vacuum Oil Co. at Melbourne, Australia.

#### Yard's Work

The development of the scheme has taken a year. The synthetic (Hose) rubber bags were specially made by the Austro-Diesel Division of Douglas Rubber (Australia) Ltd. They are built to withstand working conditions at 100F at an altitude of 20,000 ft. Working withstands stress of 2,500 lb. Moulds from the aircraft were worked out by the Engineering Research Division of Australian National Airways, Ltd.

Gasoline and other refined petroleum products, including aviation gasoline, are packaged from underground tanks into the modified aircraft fitted with four rubber bags of 300 Imperial gal each built sealed and vented, the bags occupy all the aircraft's cargo floor space. On arrival at the Goroka airstrip (170 mi. distance and over 5,000 ft above sea level) the contents are emptied by pumping or gravity into Vacuum's underground storage tanks.

#### Folded for Return

Rough bags are folded to a convenient size and stored in the aircraft for return trip. This provides maximum space in the aircraft for loading of cargo for return trip to Lae. Previously this was not practicable because of the bulk of the rough drums.

The new method will ensure continuity of supplies of petroleum products to one of the most isolated areas in the world. Later on the method will be applied in Western Australia and to other inaccessible, poorly serviced and remote areas.

The reduction of double handling of bulk oil drums and consequent decrease of flight costs are added.



**FULL SIZE** 11-ton synthetic rubber container in crash position. Working and loading drums points are built to withstand 6 G static with 2,000 lb. of water in container.



**VENTING SYSTEM** on 300 Imp gal synthetic rubber bag is shown as built at plant of Douglas Rubber Co., Melbourne. Bag withstands 180F at 20,000 ft.



## The art of rocketry

The portraits of tomorrow's propulsion systems are rapidly becoming realities at Aerojet-General. America's foremost manufacturer of rocket powerplants, Aerojet is a major contributor to this nation's most critical rocket and missile programs.

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Operations at Aerojet's California plant, near Los Angeles and Sacramento, are expanding rapidly. Unparalleled career opportunities exist for scientific and engineering personnel at all levels of experience.

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Your resume will receive immediate, confidential attention.

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## NEW AVIATION PRODUCTS

### Controlled Runway Light

Bidirectional beams of EIRC type runway light can be aimed or brightened by remote control to meet varying weather conditions. Operation is by means of a control panel in the airport tower.

Unit has a durable polyester lens system having a 100-w-115-w-



focused lamp. Each fixture stands 19 m high. Operation for each system using a remote requires a 2,400-w- circuit from a transformer used to under ground runways, installed one per light or more fixtures. A runway will require 4-10 runways.  
Crown-Hugh Co., Wolf & Seventh North Sts., Syracuse, N. Y.



### Checks Superchargers

Reading frequencies in cycles per second, Stimulcon can be used to measure and check supercharger engine revolutions, electronic units of an engine fuel controls, light amplifiers and in propeller balancing.

Probe and transmit phenomena can be instantaneously and directly read on the instrument.

Frequency range is 12,500 to 4,186 cycles per second, and range can be extended infinitely, the instrument points out, using internal frequency divider, which do not affect the unit's accuracy, greater than 0.05%.  
C. G. Conn, Ltd., Elkhart, Ind.



### Durable Interior Panels

High impact plastic sheets called Plu-Tel, being installed in the control cns of Goodrich's new rigid wing "Kanger" to provide a durable, attractive interior. Plu-Tel is a modified styrene resin which can be cut, formed, pressed and drilled. Its maker, the Chemical Division, Goodrich Tire and Rubber Co., says that the 30 x 72 in. sheets are light, tough, tough, flexible, chemically inert and come in a variety of colors.

### High Temperature Accelerometer

General KATH 510 accelerometer and external subbase follow-on used for environmental testing will measure shock and vibration phenomena up to 300° without external cooling.

Seismometer system has a frequency response from 10-200 cps and accelera-



tion range to 300G. Sensitivity is 20 ms./G, output impedance of 100 ohms. Accuracy is reported as 5%.

Colson Manufacturing Corp., Mechanics, N. J.



### Small Jack Lifts Big Planes

A jack that weighs under 100 lb., can lift a 17-ton hydraulic lifting capacity is now available to aviation. It was designed for the Air Force. Unit has a base of 9 in. to permit easy installation. The telescopic cylinder rises to 79 in. on actuation.

Los Angeles Automotive Works, 1100 Towne Ave., Los Angeles, Calif.

### Ashtester Motor for Missiles

An actuator motor that delivers 0.205 hp at 75 v. d.c. and weighs 2.5 lb. operates an electric magnetic brake that will stop the target shaft within 50

## Aeroquip Hose and Reusable Fittings Cut Maintenance Costs at Pan American World Airways



PAA designed and built the hose to provide quick access to all parts of the jet's engine.



The hose assembly depressures engine Aeroquip fittings and makes hose loss for power plants, hydraulics, and other trouble-free.



PAA's Robert Richards also uses hoses as Aeroquip hose assembly as a DC-7 fuel system.

Pan American's Overhaul Base in Miami, the largest commercial aviation maintenance base in the world, keeps a fleet of 193 Clippers in top flying condition.

Aeroquip's procedure calls for regular inspection and testing of all hose lines. When damage is found on any Aeroquip line, fittings are removed for future use and the line is replaced with a new assembly made from Pan American's supply of Aeroquip Bulk Hose and Fittings. Important savings are realized because Aeroquip fittings can be used again and again.

Complete information is available on a full range of Aeroquip hose and fitting types for all aircraft. Why not write?



PAA's Robert Richards tests equipment of the hydrotest shop, checks quality of hose lines with a gauge.

# Aeroquip

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dog of rotation after the control rod breaks and lock it in that position. It is a knuckle joint built to 0.1 in. displacement to be control basic type for control.

Motor is reversible and has a two-stage planetary gear reduction that delivers 216 rpm at the output shaft at an maximum speed of 13,000 rpm. It is a four-pole, synchronous motor 2.1 in. diameter by 6.6 in. long. Unit will operate from -60° to +450°.

Motronic Corp., 241 Concord, Glendale, Calif.

### Small Altitude Switch

Miniature, hermetic pressure switch Model GS-100 can be pre-adjusted to automatically open or close a circuit at any altitude from 1,000 to 28,000 ft. with a small differential. Weight is 1.75 to 2 oz.

Aircraft Control Division, Com Electric Co., Inc., Stamford, Conn.



### Load-Sensitive Linear Actuators

R-1500 series 26½ in. load sensitive linear actuators are available in strokes to 75 in. Units feature adjustable load sensitive switches, magnetic loading, noise-reducing filter, optional thermal pro-

tection, pressure stops and an anti-revision device. Maximum operating load is 500 lb. with 15 in./min. speed. Actuators weigh approximately 2.75 lb. They comply with MIL-A-8864.

Aerobac Aeromex Corp., 1414 Chestnut Ave., Elmhurst 5, N. J.

### ALSO ON THE MARKET

Ball-bearing push-pull control can accommodate loads up to 1,000 lb. with a stroke up to 5 in. Roller bearings provide friction-free movements of a stainless steel blade in flexible tubing as lubrication is required. Controls Corporation of America, Hagan 18 Westchester County Airport, White Plains, N. Y.

Crossed conventional degreaser, which provides automatic feeding of degreaser, is designed to handle high production cleaning of small metal parts. Unit is available in electric, steam or gas heated models. Vacuum level is controlled by a water jacket around tank exterior. Speed approximately 10 ft. per min. Capacity approximately 1,000 lb. per hr. Size 8 ft. in. high x 6 ft. wide x 15 ft. long—Phelps Manufacturing Co., 3417 West Tough Ave., Chicago 15, Ill.

Base gas with DC powered motor that is gas-circled so that output is independent of line voltage. Size 2½ in. diameter x 4½ in. long. Weight 1.7 lb. Unit incorporates a pressure relief valve and adjustable switches which can be set to close at any desired rate within range of unit. Pressure is in the range of 150 psi—Coke Industries, Inc., 1744 Stanton Ave., Dayton 4, Ohio.

Standard circuit modules and breadboard for experimental and prototype assemblies. Units can be used as plug-in or complete basic circuit modules in breadboard sockets and coupling vacuum connections with mating plug pins on plug base. In-

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Control currents... 2.0 to 40 milliamperes.  
Pressure... 1,000 to 3,000 psi.  
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wiring of breadboard. Available in several basic circuits or black diagrams—Distributor Service Division, Accutone Corp., New Bedford, Mass.

Waterproof, shock-resistant electrical connections with five assembly styles, says DVI, are being used with audio-conductor cable on ground-lanching equipment for missiles and ground order units. Assembly styles provide pin or socket contacts in receptacle or plug. Series was designed for stock dimensions consistent to omission and shrouded-shielded Divison, Bendix Aviation Corp., Schenectady, N. Y.

**Check-relief valve**, for liquid nitrogen systems having single compressor installations, maintains a balanced head between compressors. Unit acts as a check valve in one direction and a relief valve in the other. Valve conforms to test in c Specification MIL-V-25515 which has replaced Specification MIL-V-4209.

—Anderson, Greenwood & Co 1400 North Rice, Houston, Tex.

M-3140 series rotary actuators have 26 VDC motors which provide constant torque. Units include rotary wire fiber, limit switches, externally adjustable throughout entire stroke range, positive stops, optional thermal protection, and anti-collision device. Speed at max. opp. load of 150 lb. is 12 in./min. Ultimate static load is 600 lb. Unit measures 24 in. x 16 in. x 4.5 in. and weighs 8 lb. Martin Speed Section MIL-A-8856—Anthony Associates Corp., 1434 Chestnut Ave., Millville 5, N. J.

**Low temperature environmental test chambers with a largest size of 30 in. x 30 in. deep, which may be upgraded to full featured environmental test chambers without completely disrupting environmental equipment installation. A 40 horsepower door drive penetrating one side of chamber can perfect from 700 to 4500 p.s.i. automatic programming instruments allow for complete setpointing and pre-allocation. Temperature range of -100F to peak 150F. Dimensions 1 ft. wide x 5 ft. high x 10 ft. deep. Texas Engineering, Inc., 1008 Springfield Road, Uxton, N. J.**

Model 440, 5-day elapsed time aircraft clock, is manufactured, tested and regulated in accordance with MIL-C-9198 (USAF). Unit has a processor movement which records time of trip with independent stopping device. It fits standard panel openings, has a 21 in. dial, 12 hour dial with center chrono-graphic sweep around, upper hour register and lower 60 min. register—Waltham Watch Co., Inc., 15 West 47th St., New York 36, N.Y.

Twenty-five thousand Boeing B-29s powered by P&W J47 engines will be delivered to the military in 1955.

For America's early flying life, the B-29 is the only bomber in the world that can fly at 50,000 feet.

Typical flight times for both the Douglas DC-8 and the Boeing "Intercontinental" will be New York-Los Angeles 6 hours, 15 minutes; Tokyo-Seattle 8 hours, 22 minutes.

Two American mammoth orders for 25 Douglas and 20 Boeing commercial jets is the largest aircraft order ever placed by a private company... the first firm purchase of jets ever made by a U. S. airline. And Pan American recognizes that the jet age is also an age of high-performing synthetic lubricants. The company has specified fire-resistant Skydrol fluids to be used in the hydraulic systems of both lots of aircraft.

Skydrol fluids offer safety, higher lubricity than petroleum fluids, which means longer pump life, less maintenance and greater operating economy. Whatever your hydraulic fluid needs, there's a Skydrol "tailored" for the job—in jets as well as piston engine aircraft! For more information, write Organic Chemicals Division, MONSANTO CHEMICAL COMPANY, Dept. SKCDS, 801 Lewis St., Missouri.

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An Open Letter to  
the People Responsible  
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Gentlemen:

We sincerely appreciate the security with which the development of our guided missile program has been conducted. We recognize the need for such security --- our thanks to those responsible for it.

This need for security, however, has put the small American rings and circular components and weldments for jet aircraft and Guided Missile Motors of jet engines.

For many years we have been the leading manufacturers of rings and circular components and weldments for jet aircraft and Guided Missile Motors of jet engines.

With this background we feel sure that we can contribute to the guided missile program, which daily is becoming more important to national defense.

Order security regulations, which forbid by a manufacturer to discuss a problem with him, we cannot feel how or where each contribution can be made.

We want to help. We have a network of our serving for our customers that speaks for itself.

We invite you to think as to discuss your missile program.

Sincerely,

*R. Munick*  
Mr. R. Munick  
Vice President-Gales

AWM:ms

## WHAT'S NEW

### Publications Received

**Studies for Student Pilots** by Michael Rosen-Pub. in *Physiological Library*, Inc., 15 East 44th St., New York 17, N. Y. \$6.00 182 pp.

Contains complete treatment of the five basic aeromedical subjects that the student pilot must master.

**Handbook, Prefixed Circuits** Navy Aeronautical Engineering, NAVAER 16-1-119-by J. H. Mosey. \$1.75. (Order from Government Printing Office, Washington 25, D. C.)

Divided into two parts, Prefixed Circuits Manual and Notes to the Prefixed Circuits Manual, the handbook presents 33 prefixed circuits along with their schematics and characteristics and explains why they were selected and designed.

**Tables of Thermal Properties of Gases**—by J. Hilsenrath, C. W. Beckett, W. S. Benedict, L. F. Fieser, H. J. Hoge, I. F. Mon, K. L. Smith, Y. S. Touloukian, and H. W. Wausley for the National Bureau of Standards. \$3.75, 476 pp. (Order from the Government Printing Office, Washington 25, D. C.)

One of a series of compilations of thermodynamic and transport properties of gases published by the Bureau, this collection of tables covers air, argon, carbon dioxide, carbon monoxide, hydrogen, nitrogen, oxygen and steam.

**Machine Tool Electrical Standards—Manual**, revised — available from the National Machine Tool Builders' Association, 2971 East 102 St., Cleveland 4, Ohio, upon request. 14 pp.

This latest revision, the work of an Electrical Standards committee of the association, has been approved by the members of the National Machine Tool Builders' Association and by its board of directors as an industry standard.

**Aircraft Facts and Figures, 1956 Edition**—Compiled by the Aircraft Industry Association of America—Pub. by Lincoln Press, Inc., 1143 National Press Building, Washington 5, D. C. \$1.00, 183 pp.

Reference booklet which reveals statistics and pertinent facts about United States aircraft, military and civil, and the aircraft industry.

**Earth Satellites as Research Vehicles**—The proceedings of the Franklin Institute's symposium on the peaceful use of satellites (AW April 4, p. 18), is available from the Franklin Institute, 226th and the Parkway, Philadelphia 3, Pa.

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# SCIENCE AND ENGINEERING

AT LOCKHEED MISSILE SYSTEMS DIVISION



Dr. W. S. March, research specialist in aerodynamics at C. P. Polakoski, research engineer, and E. S. Swanson, aerodynamics department manager, determine stability derivatives of a high speed missile from flight records.

## THE CREATIVE APPROACH TO MISSILE SYSTEMS FLIGHT TEST ANALYSIS

The work of the Aerodynamics Department of Lockheed Missile Systems Division requires a creative approach to flight test planning and analysis. Consequently, research as well as development studies are carried on in flight determination of the performance, stability, control, thrust, aerodynamics, and aero-thermoelastic characteristics of missile airframes. Scientists and engineers are given full scope to explore new ideas, develop new experimental and evaluation techniques. Among projects of present interest are the development of high-performance free-flight models and other advanced simulation techniques and the accompanying determination of optimum flight plan and instrumentation system characteristics. The whole spectrum of flight test activities is covered.

Application and improvement of experimental planning techniques, including use of probability and statistical theory to improve test results, accuracy, reliability, and safety factors, and to decrease the expenditure of time and money

2. Determination of range and precision requirements of systems for optimum results in obtaining aerodynamic, structural and thermal parameters.
  3. The development of mathematical and physical analogs for prediction and data for missile performance, control, thrust, aerodynamic and thermal studies.
- These possessing a high order of ability applicable to this field of endeavor are wanted to work.

*Lockheed*

**MISSILE SYSTEMS DIVISION**  
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KB-50 REFUELS three F-100s at once using probe-and-drogue in tests at Eglin AFB.

## Boeing KB-50 Tanker Undergoes Three-Drogue Test at Eglin

Eglin AFB, Florida—A version of the Boeing KB-50 tanker providing three-point probe-and-drogue refueling is undergoing a three-month series of operational suitability tests by the Air Force Operational Test Center here. The three drogues are located at the two wing tips and the tail, permitting the KB-50 to service three aircraft at one time.

With storage tanks in the boom bay and under the wings, the tanker can carry enough fuel to supply seven F-100 Super Sabres in one mission. During the tests, F-100s and B-66s will be used to evaluate the tanker's performance. Two KB-50s will be used.

### Night Missions

The night missions the KB-50 has been outfitted with a battery of high-powered spotlights. A rotating wheel located at the tip of the plane's vertical stabilizer can be seen for 50 miles on a clear night.

The flight tests will be supervised by AFOTC's 324th Test Group (Operations).

The center also is beginning operational suitability tests of the technology Lockheed C-130 and has received the first of the test aircraft from Lockheed's Marietta, Georgia plant.

The C-130 C-130 was designed to operate out of unimproved front-line fields and airport bases. Its cargo compartment is larger than a standard railroad freight car. The cargo floor is 41 inches from the ground, permitting easy loading and unloading at truck-bed height.

After certification flights at Eglin,

the project team will move to Pope AFB, North Carolina to conduct aerial drop tests.

### Center 3 Years Old

The Air Force Operational Test Center recently celebrated its third anniversary. It was activated as a separate unit of the Air Proving Ground Command on Feb. 1, 1953.

Before that time, operational suitability testing was done by the Operational Testing Division of the Deputy Chief of Staff for Operations at the main headquarters.

AFOTC evaluates everything from aircraft to rocket motors. Most of the tests are made in the vast area of the Air Proving Ground Command, but much work is done at Air Force bases elsewhere in the country and at many foreign sites.

### Suitability Tests

A permanent detachment is stationed at Eglin AFB, now known to test engine systems.

Operational suitability tests are directed by the center as intended to evaluate the efficiency of equipment in the environment for which it was designed.

One of the main facilities at Eglin is the climate chamber in which the temperature can be dropped to -100° or raised to 140° to show how which appear with under extreme climatic conditions.

The hangar is now being occupied by the 315th Test Wing (Technical Support).

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See Bulletin 100, 101, 102, 103, 104, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 115, 116, 117, 118, 119, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 131, 132, 133, 134, 135, 136, 137, 138, 139, 140, 141, 142, 143, 144, 145, 146, 147, 148, 149, 150, 151, 152, 153, 154, 155, 156, 157, 158, 159, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 172, 173, 174, 175, 176, 177, 178, 179, 180, 181, 182, 183, 184, 185, 186, 187, 188, 189, 190, 191, 192, 193, 194, 195, 196, 197, 198, 199, 200, 201, 202, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 230, 231, 232, 233, 234, 235, 236, 237, 238, 239, 240, 241, 242, 243, 244, 245, 246, 247, 248, 249, 250, 251, 252, 253, 254, 255, 256, 257, 258, 259, 260, 261, 262, 263, 264, 265, 266, 267, 268, 269, 270, 271, 272, 273, 274, 275, 276, 277, 278, 279, 280, 281, 282, 283, 284, 285, 286, 287, 288, 289, 290, 291, 292, 293, 294, 295, 296, 297, 298, 299, 300, 301, 302, 303, 304, 305, 306, 307, 308, 309, 310, 311, 312, 313, 314, 315, 316, 317, 318, 319, 320, 321, 322, 323, 324, 325, 326, 327, 328, 329, 330, 331, 332, 333, 334, 335, 336, 337, 338, 339, 340, 341, 342, 343, 344, 345, 346, 347, 348, 349, 350, 351, 352, 353, 354, 355, 356, 357, 358, 359, 360, 361, 362, 363, 364, 365, 366, 367, 368, 369, 370, 371, 372, 373, 374, 375, 376, 377, 378, 379, 380, 381, 382, 383, 384, 385, 386, 387, 388, 389, 390, 391, 392, 393, 394, 395, 396, 397, 398, 399, 400, 401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 438, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 470, 471, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482, 483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494, 495, 496, 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697, 698, 699, 700, 701, 702, 703, 704, 705, 706, 707, 708, 709, 710, 711, 712, 713, 714, 715, 716, 717, 718, 719, 720, 721, 722, 723, 724, 725, 726, 727, 728, 729, 730, 731, 732, 733, 734, 735, 736, 737, 738, 739, 740, 741, 742, 743, 744, 745, 746, 747, 748, 749, 750, 751, 752, 753, 754, 755, 756, 757, 758, 759, 760, 761, 762, 763, 764, 765, 766, 767, 768, 769, 770, 771, 772, 773, 774, 775, 776, 777, 778, 779, 780, 781, 782, 783, 784, 785, 786, 787, 788, 789, 790, 791, 792, 793, 794, 795, 796, 797, 798, 799, 800, 801, 802, 803, 804, 805, 806, 807, 808, 809, 810, 811, 812, 813, 814, 815, 816, 817, 818, 819, 820, 821, 822, 823, 824, 825, 826, 827, 828, 829, 830, 831, 832, 833, 834, 835, 836, 837, 838, 839, 840, 841, 842, 843, 844, 845, 846, 847, 848, 849, 850, 851, 852, 853, 854, 855, 856, 857, 858, 859, 860, 861, 862, 863, 864, 865, 866, 867, 868, 869, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 881, 882, 883, 884, 885, 886, 887, 888, 889, 890, 891, 892, 893, 894, 895, 896, 897, 898, 899, 900, 901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925, 926, 927, 928, 929, 930, 931, 932, 933, 934, 935, 936, 937, 938, 939, 940, 941, 942, 943, 944, 945, 946, 947, 948, 949, 950, 951, 952, 953, 954, 955, 956, 957, 958, 959, 960, 961, 962, 963, 964, 965, 966, 967, 968, 969, 970, 971, 972, 973, 974, 975, 976, 977, 978, 979, 980, 981, 982, 983, 984, 985, 986, 987, 988, 989, 990, 991, 992, 993, 994, 995, 996, 997, 998, 999, 1000, 1001, 1002, 1003, 1004, 1005, 1006, 1007, 1008, 1009, 1010, 1011, 1012, 1013, 1014, 1015, 1016, 1017, 1018, 1019, 1020, 1021, 1022, 1023, 1024, 1025, 1026, 1027, 1028, 1029, 1030, 1031, 1032, 1033, 1034, 1035, 1036, 1037, 1038, 1039, 1040, 1041, 1042, 1043, 1044, 1045, 1046, 1047, 1048, 1049, 1050, 1051, 1052, 1053, 1054, 1055, 1056, 1057, 1058, 1059, 1060, 1061, 1062, 1063, 1064, 1065, 1066, 1067, 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1085, 1086, 1087, 1088, 1089, 1090, 1091, 1092, 1093, 1094, 1095, 1096, 1097, 1098, 1099, 1100, 1101, 1102, 1103, 1104, 1105, 1106, 1107, 1108, 1109, 1110, 1111, 1112, 1113, 1114, 1115, 1116, 1117, 1118, 1119, 1120, 1121, 1122, 1123, 1124, 1125, 1126, 1127, 1128, 1129, 1130, 1131, 1132, 1133, 1134, 1135, 1136, 1137, 1138, 1139, 1140, 1141, 1142, 1143, 1144, 1145, 1146, 1147, 1148, 1149, 1150, 1151, 1152, 1153, 1154, 1155, 1156, 1157, 1158, 1159, 1160, 1161, 1162, 1163, 1164, 1165, 1166, 1167, 1168, 1169, 1170, 1171, 1172, 1173, 1174, 1175, 1176, 1177, 1178, 1179, 1180, 1181, 1182, 1183, 1184, 1185, 1186, 1187, 1188, 1189, 1190, 1191, 1192, 1193, 1194, 1195, 1196, 1197, 1198, 1199, 1200, 1201, 1202, 1203, 1204, 1205, 1206, 1207, 1208, 1209, 1210, 1211, 1212, 1213, 1214, 1215, 1216, 1217, 1218, 1219, 1220, 1221, 1222, 1223, 1224, 1225, 1226, 1227, 1228, 1229, 1230, 1231, 1232, 1233, 1234, 1235, 1236, 1237, 1238, 1239, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 1249, 1250, 1251, 1252, 1253, 1254, 1255, 1256, 1257, 1258, 1259, 1260, 1261, 1262, 1263, 1264, 1265, 1266, 1267, 1268, 1269, 1270, 1271, 1272, 1273, 1274, 1275, 1276, 1277, 1278, 1279, 1280, 1281, 1282, 1283, 1284, 1285, 1286, 1287, 1288, 1289, 1290, 1291, 1292, 1293, 1294, 1295, 1296, 1297, 1298, 1299, 1300, 1301, 1302, 1303, 1304, 1305, 1306, 1307, 1308, 1309, 1310, 1311, 1312, 1313, 1314, 1315, 1316, 1317, 1318, 1319, 1320, 1321, 1322, 1323, 1324, 1325, 1326, 1327, 1328, 1329, 1330, 1331, 1332, 1333, 1334, 1335, 1336, 1337, 1338, 1339, 1340, 1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1349, 1350, 1351, 1352, 1353, 1354, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1365, 1366, 1367, 1368, 1369, 1370, 1371, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1380, 1381, 1382, 1383, 1384, 1385, 1386, 1387, 1388, 1389, 1390, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1405, 1406, 1407, 1408, 1409, 1410, 1411, 1412, 1413, 1414, 1415, 1416, 1417, 1418, 1419, 1420, 1421, 1422, 1423, 1424, 1425, 1426, 1427, 1428, 1429, 1430, 1431, 1432, 1433, 1434, 1435, 1436, 1437, 1438, 1439, 1440, 1441, 1442, 1443, 1444, 1445, 1446, 1447, 1448, 1449, 1450, 1451, 1452, 1453, 1454, 1455, 1456, 1457, 1458, 1459, 1460, 1461, 1462, 1463, 1464, 1465, 1466, 1467, 1468, 1469, 1470, 1471, 1472, 1473, 1474, 1475, 1476, 1477, 1478, 1479, 1480, 1481, 1482, 1483, 1484, 1485, 1486, 1487, 1488, 1489, 1490, 1491, 1492, 1493, 1494, 1495, 1496, 1497, 1498, 1499, 1500, 1501, 1502, 1503, 1504, 1505, 1506, 1507, 1508, 1509, 1510, 1511, 1512, 1513, 1514, 1515, 1516, 1517, 1518, 1519, 1520, 1521, 1522, 1523, 1524, 1525, 1526, 1527, 1528, 1529, 1530, 1531, 1532, 1533, 1534, 1535, 1536, 1537, 1538, 1539, 1540, 1541, 1542, 1543, 1544, 1545, 1546, 1547, 1548, 1549, 1550, 1551, 1552, 1553, 1554, 1555, 1556, 1557, 1558, 1559, 1560, 1561, 1562, 1563, 1564, 1565, 1566, 1567, 1568, 1569, 1570, 1571, 1572, 1573, 1574, 1575, 1576, 1577, 1578, 1579, 1580, 1581, 1582, 1583, 1584, 1585, 1586, 1587, 1588, 1589, 1590, 1591, 1592, 1593, 1594, 1595, 1596, 1597, 1598, 1599, 1600, 1601, 1602, 1603, 1604, 1605, 1606, 1607, 1608, 1609, 1610, 1611, 1612, 1613, 1614, 1615, 1616, 1617, 1618, 1619, 1620, 1621, 1622, 1623, 1624, 1625, 1626, 1627, 1628, 1629, 1630, 1631, 1632, 1633, 1634, 1635, 1636, 1637, 1638, 1639, 1640, 1641, 1642, 1643, 1644, 1645, 1646, 1647, 1648, 1649, 1650, 1651, 1652, 1653, 1654, 1655, 1656, 1657, 1658, 1659, 1660, 1661, 1662, 1663, 1664, 1665, 1666, 1667, 1668, 1669, 1670, 1671, 1672, 1673, 1674, 1675, 1676, 1677, 1678, 1679, 1680, 1681, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1697, 1698, 1699, 1700, 1701, 1702, 1703, 1704, 1705, 1706, 1707, 1708, 1709, 1710, 1711, 1712, 1713, 1714, 1715, 1716, 1717, 1718, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1751, 1752, 1753, 1754, 1755, 1756, 1757, 1758, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1786, 1787, 1788, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1799, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820, 1821, 1822, 1823, 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1831, 1832, 1833, 1834, 1835, 1836, 1837, 1838, 1839, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1857, 1858, 1859, 1860, 1861, 1862, 1863, 1864, 1865, 1866, 1867

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## Piasecki H-21B Lifts Cargo

Piasecki H-21B helicopter from 11th Air Force, Stewart AFB, Tenn., lifts 1,000 lb. crate of DEW line equipment during test. Successful orbit tests with the H-21 resulted in discontinuity of a helicopter and its shift to a base on the Alaskan Arctic Coast via 41st Troop Group Wing C-124. The H-21 will move DEW line equipment into Alaska using one known during the season to use when the ice is too rough or heavy for the big C-124s to land.

## USAF Awards Contract For Optical Devices

Perkin-Elmer Corp., Norwalk, Conn., was awarded a \$1,540,000 contract last week for design, development and fabrication of recording optical tracking instruments to be used in the Air Force long range guided missile test range program.

Under terms of the USAF contract, the firm will build two factories in Florida to house the instruments, which will be used in the largest of the type ever built and incorporating automatic fixtures. The instruments will be built in the Engineering and Optical Divisions of the company.

Perkin-Elmer is a supplier of infrared viewing systems, headlights, and large auto photographic lenses as well as such tracking devices.

## Ground Support Unit Contract to Beech

Additional MD-3 ground support equipment units for the aircraft will be manufactured under a \$115 million USAF contract by Beech Aircraft Corp., Wichita, Kan. The contract, the largest single order ever awarded Beech for ground support equipment, spans a 12-month period from October, continuing through May.

Beechcraft MD-3 generators have been used by the Air Force since December 1954, when deliveries began on an emergency order. They were designed for portability and ground test of 3-67 medium bombers but have been used for B-52s and jet fighters.



## Vibration Test

High frequency test being run on electromagnetic high frequency vibration center at research laboratory of Robinson Electronics, Inc., Teterboro, N. J. is observed by C. E. Robinson, president of the firm and G. de Forest Lewis, chairman. The equipment is capable of operation up to 2,000 cps.

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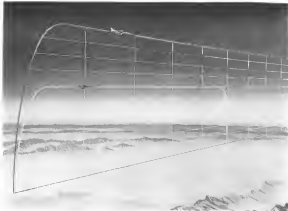
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## Fuel Filter-Dehydrators

This battery of four fuel filter-dehydrators, installed at San Francisco International Airport by Standard Oil Co. of California, removes all water which might be in aviation fuel pumped at that terminal. The units, each of which has a 600 gpm capacity, also remove any solid contaminants in the fuel. Features of the dehydrators include use of assembled centrifugal of padlocked T-bolts which reduce any water present into droplets; no valve means opening valve to remove water from the bottom of the units is not complicated, and an automatic drag control which shuts down fuel flow in case large quantities of water are detected in the fuel. Manufacturer is the Fuel Weyer Division, Brown, Inc.

## Afterburner Exhaust Heat Measured

A winging probe to measure the exhaust gas temperature of an afterburning jet engine has been developed and successfully used in flight tests at Ames Aeronautical Laboratory, NACA.

Use of the probe in a series of flight tests showed that the heat threat of the rocketed powerplant and exhaust could be measured to about 5%.

Using two standard orifice nozzles, the probe measured the temperature of the gas stream in a fraction of a second. Calibration indicates the probe to be correct within about 10%, with a system time lag of less than 0.01 sec.

Possible other uses of the probe include free-stream static temperature indicator, in conjunction with a sample compressor to correct the Mach number, and a turbine temperature indicator for afterburner control.

Reason for the development of the winging probe was to make complete out surveys of the flow from the engine. This is one of two possible ways to—

"A Static-Flow Orifice Probe for the In-Flight Measurement of Jet-Engine Exhaust of a Jet Engine Exhaust with Afterburning (TN 1744), by C. Dewey Hill and L. Streetman Hall, Ames Aeronautical Laboratory.

determine jet exit flow, the other is to measure all the static to exit up the individual static lines.

With the exit static flow and temperature measured, the actual performance of the engine installation can be determined. This result can be used to determine the actual engine drag.

## PRODUCTION BRIEFING

**Bellows Co.**, pneumatics manufacturer of Akron, Ohio, is erecting a new West Coast office at Glendale, Calif., which will serve as headquarters for both the Bellows Co. of California and the South Johnson Manufacturing Division of the Bellows Co.

**Harco Instrument Corp.**, New York, has established a Metropolitan New York office for their K/VAC analog computers, and other vacuum-tube computers. The office will be located at the Manhattan plant.

**Epoxy-glass laminate** for checking the alignment of the Lockheed C-130 Hercules upper front window area is made of glass cloth and Bakelite plastic (manufactured by Raychem, Los Angeles as Vespelene).

**Harvey Abramson**, Torrance, Calif., a division of Harvey Machine Co., announced it is in final production on 6006 wrought alloy stainless in hollow bar.

## THREE-AXIS FLIGHT SIMULATOR

Providing a flight table which can be continuously elevated in space with respect to three mutually perpendicular reference axes, the CII Dynamic Flight Simulator can be programmed directly from the output of a computer. Operating smoothly with no gearing, the instrument accepts independent voltage regulation of the three axes and

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stock. Standard models are available from 8 in. through 25 in. in 6 in. increments and 22 through 36 in. in 4 in. increments. Wall thicknesses vary from 100 to 500 with other sizes subject to engineering.

Aircraft connector problems were discussed at a recent symposium sponsored by the Deutsch Co., Huntington Park, Calif. Meeting opened to both aviation and non-aviation was held through in Deutsch to gather industry information and comments upon which to base design of their new line of connectors.

Betal is now being supplied commercially by Brooks & Parnell, Inc., Detroit. Consisting of a core of boron carbide clad on both sides with pure aluminum, Betal is used for reaction bonding in stress energy applications.



Replacible Avionics has that the large single-point 1/4 in. fitting in use of the largest size rods for a light fixture.

Narda Corp., Mineola, N.Y., has two European sales outlets for its microwave and VHF and equipment. The companies was that this is the result of the growing electronic and aviation industries in the two countries concerned, Belgium and Sweden. The representative are Republique Belge, Brussels, Belgium and Fildstroms Velegat AB of Stockholm, Sweden.

James-Paul-Glick, Pasadena, Calif., which sells, manufactures, and repairs that its new name will be Glick Seal Products Co., Inc.

Berlin Corp., Reading, Pa., has a new left-handed wrench in Detroit to name that are better with its Berlin Berlin Corp. engineer roller offers, cutting right and left bolts.

Loan Electric Motor Co., Lenox, Ohio, has opened a new branch office in Detroit.

Silicone Products Dept., General Electric Co., Waltham, N.Y., has added a silicone rubber cloth coating compound to its silicone products. Designated SE 701, this compound will allow ducts to carry air at temperatures



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All Hayes Aircraft there is an invisible force, with neither shape nor form. Yet this intangible element has set Hayes apart in a field of its own and is a prime reason for the Company's growth. This priceless ingredient is the personal integrity of Hayes craftsmen — the engineer with his problems of design, the production personnel who obtain raw materials, the scientist in his laboratory, the machinist, the electrician, the test pilot, the sheet metal worker, the dental craftsman — each making their own individual contribution to the overall operation.

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- Quality control of materials and workmanship.
- Delivery schedules consistently fulfilled.
- Costs that are competitive.

Thus, this priceless ingredient of integrity is largely responsible for placing Hayes Aircraft, in the five short years, at the forefront of aircraft modification and overhaul.



## POSITIONS OPEN FOR ENGINEERS

With nearly 4,000 employees, Hayes is now a competitive independent facility for modification and maintenance of aircraft — including largest size planes.

Opportunity open for experienced design engineers, graduates and undergraduate engineering students. Write Personnel Department.

**WANTED! ENGINEERS TO HELP MAKE  
LONG RANGE MISSILE HISTORY**

### North America's Most Projects Offer A New Engineering Adventure

With complete weapons system responsibility for the SM-64 Navaho, Intercontinental Guided Missile, North American is engaged in one of the most challenging programs yet offered. But every such of program is a tough scientific battle. New means are daily being found to solve the complex problems.

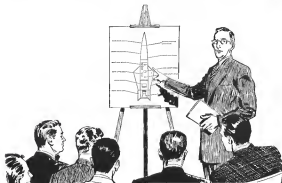
which the development of living organisms proceeds in the fields of structure, temperature and aerodynamics. That most important of all, men must be found who derive on this kind of challenge... men who are really excited about this new matrix science. Are you one of them?

If you qualify in one of the fields we have listed below, chances are you can qualify for this unique expedition into the technology of the future. We would like to tell you about all the physical and professional advantages of a career in North American's Missile Development Engineering.

Please contact us for the full story:

Instrumentation Design, Development & Application	Standards, Drawings Checking, Specifications Writing
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Hydraulics, Pneumatics & Servo Engineering	Armament Systems & Components Engineering
Aerodynamics	Mechanical & Electrical Design
Engineering Flight Test	High Temperature Materials Engineering

Eastcott B. L. Cunningham, Alaska Engineering Personnel Office  
East 91-20 Ave. 10214 Lakewood Boulevard, Boulder, Calif.

NORTH AMERICAN AVIATION, INC. 

as high as 700° or as low as 120°. It is said to have resistance to  $\text{Si}_2\text{H}_2\text{Cl}_2$  500 and 700, IP4, positive, MIL-e 7805 and MIL-7506.

Hall-Howard's Hillingdon plant near Glasgow, Scotland, is producing 375 Mazda engines at \$2,800,000 for the Spanish Air Ministry.

Some Feature Keys is said to save up to 50% labor costs in laying out and rolling out feature base plates, because the



streamed construction elevates the mail sorting operations. Jorgens Tool Supply Co., Cleveland, Ohio.

**Coast Manufacturing & Supply Co.,** Lakewood, Calif., has opened an engineering service facility in Chicago. Marketing under the name "Tactano Glass Fabrics," Coast manufactures flexible fabrics plain, finished, or impregnated with epoxy, silicone, Pterobac or polyethylene urethane.

Schen Process Division, of Forts Co. Corp., Manhett, N. Y., is doubling production space to 60,000 sq. ft. to meet the increased demand for Isolt's laminated fibreglass products. Because of its resistance to certain chemicals, the company says that Isolt has been widely used for glazing tanks, fume hoods and filter bags troughs.

Swadlow Ironclash Co., East Wyalusing, Wis., announces that it has provided special cold storage areas for its new line of Stamping permegrate materials in the recent addition to its plant.

Tinsley Engineering, Inc., Union, N. J., leading suppliers and manufacturers of refrigeration and commercial test equipment have named Albi Engineering Co., Detroit, as exclusive sales engineering representatives for former commercial equipment in the Rocky Mountain area.

Applicants for New York University's second annual Titusman lecture Sept. 10 through 14 may register by writing Dr. Harold Margolin, N.Y.U. College of Engineering, University Heights 53, N.Y.

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The offer is made only by the Prospectus.

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June 19, 1964

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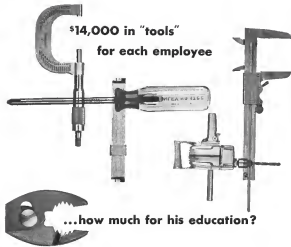
Please contact: E. C. Smith  
Aerospace Engineering Personnel  
Dept. 991-20 AW  
22114 Lakewood Blvd., Downey, Calif.

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Today, business invests an average of \$14,000 in each employee's job. The question for businessmen is: Are we training enough people who can hold down these jobs? Schools are the answer. And it's simple self interest to help community groups get the teachers and equipment schools need. Shortage right now: 200,000 classrooms, 165,000 teachers!



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Better Schools, 9 East 48th Street, New York, N. Y.



CHILD looks for pulse rate at 230.



MEDICAL assistant administers Oxygen.



BOY coughs quickly, but cough means.

## Brazilian Airlift Treats Whooping Cough

By Peter Weisner

Rio de Janeiro—In the dark light of an apartment in Rio, a child was coughing, turning red then purple from lack of air. A doctor ran called. His prescription: Service Aereo de Cooque-luche.

The service is an airlift run by the Brazilian Air Force, probably the only one of its kind in the world. Cooque-luche is a Brazilian word for whooping cough. And in Brazil whooping cough is one of the most dreaded child diseases, yearly attacking hundreds of thousands.

In 1941, some Air Force doctors feared that if a child stricken with whooping cough was quickly flown up to around 12,000 ft. and kept at that altitude for seven days or longer, the coughing stopped. In many cases a complete cure was noted after one to three flights.

### Flights Are Free

Now the Air Force has a special depot at Santa Theresa Airport on downtown Rio for whooping cough victims.

This month an extra flight was added to the service to provide four scheduled flights a week in specially equipped C-47 aircraft. The service also includes non-scheduled flights in the interim for communities hard hit by the disease. All flights are free to anyone with a doctor's prescription. Last year, the service handled more than 10,000 children. This year the total is expected to be over 15,000.

Why the 12,000 ft. altitude helps combat whooping cough is a mystery,

but the results are often feared unnecessary. Capt. Ito Licio Job, an Air Force doctor who heads the service, gives this opinion.

"The lungs have to work much harder at that altitude to get oxygen (beyond 12,000 feet is not practical because there is too little oxygen). The extra pumping of the lungs causes an increased flaking out of carbon dioxide, which in turn produces higher alkalinity (less or lower acid formed). The alkalinity impends increases in pulse rate, blood cells that fight off the disease, thus putting the patient on the road to recovery."

Doctors do not agree on this theory and some call the airlift a waste of time.

The Air Force admits that all children are not cured by the treatment. But the Air Force claims more than 50% of all children cannot have it crowded in crowded homes, in many cases in less than a week.

To apply for the service, a Brazilian parent has to have a note from a doctor stating that the child needs his whooping cough and is in good enough condition to make the flight. The parent then goes to the line and is checked in by an Air Force doctor and scheduled for a flight.

### Warm Clothing

Parents are warned to bring warm clothing to guard against the cool, freezing temperatures. A child under seven years old must be accompanied by a parent or guardian.

The crew on the C-47 consists of a pilot, copilot, mechanic, radio-man,

Air Force doctor and two medical corporals. The children and parents are strapped into bucket seats leaving the sides of the plane and the doctor stands by, with oxygen. Usually there are 40 children on a flight and enough oxygen is on shore for all of them if necessary.

### Climbs at 230 f.p.s.

After take-off the C-47 climbs at 230 f.p.s. to around 11,500 ft. At this altitude the pilot sets a course for Cabo Frio where there is a flat coastal and less chance of turbulence. The children usually whang and cough loudly until the plane levels off at cruising altitude. Then coughing begins to stop. The doctor checks temperature, and pulse repeatedly and often makes use of oxygen for babies with acute breathing or too rapid pulse.

During one flight a little boy fainted. He was a year and a half old and the whooping cough had left him pale and with big dark spots under his eyes.

The doctor checked his pulse. It was a dangerous 160. Oxygen was given and the boy came around, and a little and went to sleep.

"This service sort of gets you there, don't keep on as it being," one parent said as he pointed to the patient corps of white linen and downy beds.

Actually, the Air Force gets double duty out of its Service de Cooque-luche. The flight crew is often given exceptional and professional training for training. During many of these special flights, the copilot's seat is surrendered



This Hermetic Integrating Gyro is the heart of Honeywell's self-contained, non-radiating, inertial navigation and guidance systems. Relying solely on inertial sensing devices, these systems can, unaided, direct missiles and aircraft to target or destination. This represents another milestone in flight guidance, made possible by Honeywell's advanced gyro design.

AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL



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MANY NEW SYSTEM DESIGN—like the hermetic integrating gyro shown above and on the facing page—are currently being developed by Honeywell Aero. And Honeywell's accelerated development program will be busy with such advanced and challenging projects.

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### Write to us.

If you are interested in a career at Honeywell, call or send your résumé to: Eusebio Wood Technical Director, Aeronautical Division, Dept. AW-1156, 2662 Selway Road, Minneapolis 13.

**Honeywell**

AERONAUTICAL DIVISION



**WHOOPING COUGH** sickens C-47 as it starts out. One bus waits to board as another gets off.

with a great risk for logging in blood flying free.

While the flight drags on, most of the children mantle full sleep, headed to parents' arms. But some still talk around and are entertained by the flight crew with paper planes and are given occasional peeks into the flight cabin.

After an hour, the plane descends (500 fpm) to a landing at Santos Dumont where another line of children and parents waits. One doctor, standing in to go on a flight, shrugged his shoulders, saying, "Maybe it's all in their minds—we're not sure what happens to them, but in many weeks away from here after a few flights and



**WHEN** 13,000 ft altitude is reached, children stop coughing at this time it's along

never sleep or cough again. . . They put on weight and get their color back."

Because of the growing loss of parents and children waiting for flights, the government is enlarging the service. Now the only scheduled route is to Rio. Next year there probably will be regular service at least three other major cities.

## CAB Approves Brazilian Route Into Chicago

Washington—Automatic Brazil's international route to the United States has been extended to Chicago by the Civil Aeronautics Board.

With the new approval, Aerovias Brasil will be able to offer through service from Chicago to points in the Caribbean area and Rio de Janeiro, Sao Paulo, Montevideo and Buenos Aires. The airline plans to begin service within the next 15 days, with weekly DC-4 flights. Extension of the route to Empresa de Transportes, Aerovias Brasil S. A. from its present terminal at Miami gives the carrier a route already provided for in the bilateral air agreement between Brazil and the United States.

Aerovias Brasil's present route allows the carrier to operate between points in Brazil and New Orleans, Miami and Chicago via Passagem, Georgetown, Port of Spain, Caracas, Ciudad Trujillo, Guaymas and Havana.

## New York Dedicates Air Cargo Center

New York—The Port of New York Authority last week dedicated its new 55.5 million sq ft cargo center at New York International Airport. The five-story building, containing 80 acres, contains four overhalls 500/50-ft air cargo buildings and a two-story air cargo service building for internal or external services, freight forwarding, customs brokers, warehouse services and cargo companies. The cargo buildings provide freight handling and office space for 77 airlines. Total floor area of the five buildings is 349,000 sq ft.

## Air Express International Announces Moscow Rates

An Express International has announced through cargo rates to Moscow in anticipation of free trade relations between the U. S. and Russia. They are \$1.70 per lb. for 100 lbs. or less, \$1.45 per lb. for shipments over 100 lbs.

AET expects third or fourth increasing rates in Moscow. Shippers are hesitant to use strategic materials and those not used in construction.

# Figures Released for Fiscal 1957 Federal Aid Airport Projects

The airport-by-airport breakdown of the \$18,841,777 Federal Aid airport projects for fiscal 1957 (AW June 13, p. 18) follows:

<b>ALABAMA</b>	
Birmingham Municipal Airport	\$23,000
Montgomery Municipal Airport	10,000
Montgomery Executive Field	10,000
Mobile County Airport	10,000
Thibodaux State Airport	10,000
<b>ARIZONA</b>	
Casa Grande Municipal Airport	3,000
Phoenix Municipal Airport	10,000
Phoenix Sky Harbor Municipal Airport	10,000
Flagstaff Municipal Airport	10,000
Glendale Municipal Airport	10,000
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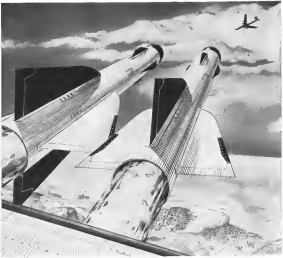
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## TWA's New Overhaul Base

Trans World Airlines has moved its engine overhaul activities from its old overhaul base at Pader Airport, Kansas City, Mo., to its new quarters at the Mid-America International airport which the city of Kansas City, Mo., is building. The new base (right) will be completed next year. The engine shop, a producing six engines a day. It is designed to use 1,000 hp capacity, down to 100 hp, and is now designed to handle engine overhaul when TWA begins to operate Boeing 707s.



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INFORMATION BOOKLET  
New brochures on Solar's guided missile production capabilities, write Dept. C-45, Solar Aircraft Company, San Diego 12, Calif.

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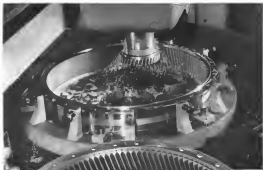
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PUBLISHING DATE

**August 6, 1956**



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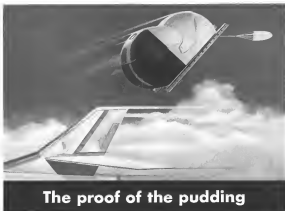
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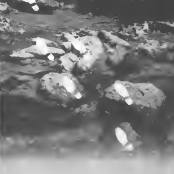
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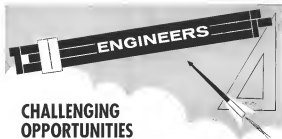
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2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 2680, 2681, 2682, 2683, 2684, 2685, 2686, 2687, 2688, 2689, 2690, 2691, 2692, 2693, 2694, 2695, 2696, 2697, 2698, 2699, 2700, 2701, 2702, 2703, 2704, 2705, 2706, 2707, 2708, 2709, 2710, 2711, 2712, 2713, 2714, 2715, 2716, 2717, 2718, 2719, 2720, 2721, 2722, 2723, 2724, 2725, 2726, 2727, 2728, 2729, 2730, 2731, 2732, 2733, 2734, 2735, 2736, 2737, 2738, 2739, 2740, 2741, 2742, 2743, 2744, 2745, 2746, 2747, 2748, 2749, 2750, 2751, 2752, 2753, 2754, 2755, 2756, 2757, 2758, 2759, 2760, 2761, 2762, 2763, 2764, 2765, 2766, 2767, 2768, 2769, 2770, 2771, 2772, 2773, 2774, 2775, 2776, 2777, 2778, 2779, 2780, 2781, 2782, 2783, 2784, 2785, 2786, 2787, 2788, 2789, 2790, 2791, 2792, 2793, 2794, 2795, 2796, 2797, 2798, 2799, 2800, 2801, 2802, 2803, 2804, 2805, 2806, 2807, 2808, 2809, 2810, 2811, 2812, 2813, 2814, 2815, 2816, 2817, 2818, 2819, 2820, 2821, 2822, 2823, 2824, 2825, 2826, 2827, 2828, 2829, 2830, 2831, 2832, 2833, 2834, 2835, 2836, 2837, 2838, 2839, 2840, 2841, 2842, 2843, 2844, 2845, 2846, 2847, 2848, 2849, 2850, 2851, 2852, 2853, 2854, 2855, 2856, 2857, 2858, 2859, 2860, 2861, 2862, 2863, 2864, 2865, 2866, 2867, 2868, 2869, 2870, 2871, 2872, 2873, 2874, 2875, 2876, 2877, 2878, 2879, 2880, 2881, 2882, 2883, 2884, 2885, 2886, 2887, 2888, 2889, 2890, 2891, 2892, 2893, 2894, 2895, 2896, 2897, 2898, 2899, 2900, 2901, 2902, 2903, 2904, 2905, 2906, 2907, 2908, 2909, 2910, 2911, 2912, 2913, 2914, 2915, 2916, 2917, 2918, 2919, 2920, 2921, 2922, 2923, 2924, 2925, 2926, 2927, 2928, 2929, 2930, 2931, 2932, 2933, 2934, 2935, 2936, 2937, 2938, 2939, 2940, 2941, 2942, 2943, 2944, 2945, 2946, 2947, 2948, 2949, 2950, 2951, 2952, 2953, 2954, 2955, 2956, 2957, 2958, 2959, 2960, 2961, 2962, 2963, 2964, 2965, 2966, 2967, 2968, 2969, 2970, 2971, 2972, 2973, 2974, 2975, 2976, 2977, 2978, 2979, 2980, 2981, 2982, 2983, 2984, 2985, 2986, 2987, 2988, 2989, 2990, 2991, 2992, 2993, 2994, 2995, 2996, 2997, 2998, 2999, 3000, 3001, 3002, 3003, 3004, 3005, 3006, 3007, 3008, 3009, 3010, 3011, 3012, 3013, 3014, 3015, 3016, 3017, 3018, 3019, 3020, 3021, 3022, 3023, 3024, 3025, 3026, 3027, 3028, 3029, 3030, 3031, 3032, 3033, 3034, 3035, 3036, 3037, 3038, 3039, 3040, 3041, 3042, 3043, 3044, 3045, 3046, 3047, 3048, 3049, 3050, 3051, 3052, 3053, 3054, 3055, 3056, 3057, 3058, 3059, 3060, 3061, 3062, 3063, 3064, 3065, 3066, 3067, 3068, 3069, 3070, 3071, 3072, 3073, 3074, 3075, 3076, 3077, 3078, 3079, 3080, 3081, 3082, 3083, 3084, 3085, 3086, 3087, 3088, 3089, 3090, 3091, 3092, 3093, 3094, 3095, 3096, 3097, 3098, 3099, 3100, 3101, 3102, 3103, 3104, 3105, 3106, 3107, 3108, 3109, 3110, 3111, 3112, 3113, 3114, 3115, 3116, 3117, 3118, 3119, 3120, 3121, 3122, 3123, 3124, 3125, 3126, 3127, 3128, 3129, 3130, 3131, 3132, 3133, 3134, 3135, 3136, 3137, 3138, 3139, 3140, 3141, 3142, 3143, 3144, 3145, 3146, 3147, 3148, 3149, 3150, 3151, 3152, 3153, 3154, 3155, 3156, 3157, 3158, 3159, 3160, 3161, 3162, 3163, 3164, 3165, 3166, 3167, 3168, 3169, 3170, 3171, 3172, 3173, 3174, 3175, 3176, 3177, 3178, 3179, 3180, 3181, 3182, 3183, 3184, 3185, 3186, 3187, 3188, 3189, 3190, 3191, 3192, 3193, 3194, 3195, 3196, 3197, 3198, 3199, 3200, 3201, 3202, 3203, 3204, 3205, 3206, 3207, 3208, 3209, 3210, 3211, 3212, 3213, 3214, 3215, 3216, 3217, 3218, 3219, 3220, 3221, 3222, 3223, 3224, 3225, 3226, 3227, 3228, 3229, 3230, 3231, 3232, 3233, 3234, 3235, 3236, 3237, 3238, 3239, 3240, 3241, 3242, 3243, 3244, 3245, 3246, 3247, 3248, 3249, 3250, 3251, 3252, 3253, 3254, 3255, 3256, 3257, 3258, 3259, 3260, 3261, 3262, 3263, 3264, 3265, 3266, 3267, 3268, 3269, 3270, 3271, 3272, 3273, 3274, 3275, 3276, 3277, 3278, 3279, 3280, 3281, 3282, 3283, 3284, 3285, 3286, 3287, 3288, 3289, 3290, 3291, 3292, 3293, 3294, 3295, 3296, 3297, 3298, 3299, 3300, 3301, 3302, 3303, 3304, 3305, 3306, 3307, 3308, 3309, 3310, 3311, 3312, 3313, 3314, 3315, 3316, 3317, 3318, 3319, 3320, 3321, 3322, 3323, 3324, 3325, 3326, 3327, 3328, 3329, 3330, 3331, 3332, 3333, 3334, 3335, 3336, 3337, 3338, 3339, 3340, 3341, 3342, 3343, 3344, 3345, 3346, 3347, 3348, 3349, 3350, 3351, 3352, 3353, 3354, 3355, 3356, 3357, 3358, 3359, 3360, 3361, 3362, 3363, 3364, 3365, 3366, 3367, 3368, 3369, 3370, 3371, 3372, 3373, 3374, 3375, 3376, 3377, 3378, 3379, 3380, 3381, 3382, 3383, 3384, 3385, 3386, 3387, 3388, 3389, 3390, 3391, 3392, 3393, 3394, 3395, 3396, 3397, 3398, 3399, 3400, 3401, 3402, 3403, 3404, 3405, 3406, 3407, 3408, 3409, 3410, 3411, 3412, 3413, 3414, 3415, 3416, 3417, 3418, 3419, 3420, 3421, 3422, 3423, 3424, 3425, 3426, 3427, 3428, 3429, 3430, 3431, 3432, 3433, 3434, 3435, 3436, 3437, 3438, 3439, 3440, 3441, 3442, 3443, 3444, 3445, 3446, 3447, 3448, 3449, 3450, 3451, 3452, 3453, 3454, 3455, 3456, 3457, 3458, 3459, 3460, 3461, 3462, 3463, 3464, 3465, 3466, 3467, 3468, 3469, 3470, 3471, 3472, 3473, 3474, 3475, 3476, 3477, 3478, 3479, 3480, 3481, 3482, 3483, 3484, 3485, 3486, 3487, 3488, 3489, 3490, 3491, 3492, 3493, 3494, 3495, 3496, 3497, 3498, 3499, 3500, 3501, 3502, 3503, 3504, 3505, 3506, 3507, 3508, 3509, 3510, 3511, 3512, 3513, 3514, 3515, 3516, 3517, 3518, 3519, 3520, 3521, 3522, 3523, 3524, 3525, 3526, 3527, 3528, 3529, 3530, 3531, 3532, 3533, 3534, 3535, 3536, 3537, 3538, 3539, 3540, 3541, 3542, 3543, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3552, 3553, 3554, 3555, 3556, 3557, 3558, 3559, 3560, 3561, 3562, 3563, 3564, 3565, 3566, 3567, 3568, 3569, 3570, 3571, 3572, 3573, 3574, 3575, 3576, 3577, 3578, 3579, 3580, 3581, 3582, 3583, 3584, 3585, 3586, 3587, 3588, 3589, 3590, 3591, 3592, 3593, 3594, 3595, 3596, 3597, 3598, 3599, 3600, 3601, 3602, 3603, 3604, 3605, 3606, 3607, 3608, 3609, 3610, 3611, 3612, 3613, 3614, 3615, 3616, 3617, 3618, 3619, 3620, 3621, 3622, 3623, 3624, 3625, 3626, 3627, 3628, 3629, 3630, 3631, 3632, 3633, 3634, 3635, 3636, 3637, 3638, 3639, 3640, 3641, 3642, 3643, 3644, 3645, 3646, 3647, 3648, 3649, 3650, 3651, 3652, 3653, 3654, 3655, 3656, 3657, 3658, 3659, 3660, 3661, 3662, 3663, 3664, 3665, 3666, 3667, 3668, 3669, 3670, 3671, 3672, 3673, 3674, 3675, 3676, 3677, 3678, 3679, 3680, 3681, 3682, 3683, 3684, 3685, 3686, 3687, 3688, 3689, 3690, 3691, 3692, 3693, 3694, 3695, 3696, 3697,











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